University of Washington

ARBORETUM BULLETIN

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Concerning this issue . . .

Roy and Sylvia Taylor provide an overview of the very interesting gardens and activities of the Botanical Garden at the University of British Columbia. Don't miss an opportunity to visit the specialized gardens such as the alpine, peat and Physick gardens.

Brian Mulligan concludes his article on the beauties and other merits of the species of *Styrax* in the Arboretum. Their blooming will be a spring and summer treat to anticipate.

In another two-part article, Jan Pirzio-Biroli gives a lively account of the Arboretum's Horticultural Tour of New Zealand, with more beautiful photographs of the plants and countryside.

In a medicinal vein, the wondrous willow tree receives well-deserved publicity in Gail Gensler's history of medicinal uses of the willow tree and of its derivative, aspirin.

Don't miss the article —Plant Problems and Problem Plants— about toxic plants in your garden. Marjorie Clausing, formerly of the Poison Control Center at Children's Orthopedic Hospital, describes some common poisonous plants and provides helpful suggestions for dealing with them.

We wish Richard van Klaveren enjoyment in his retirement, and welcome James Clark to the Center for Urban Horticulture.

SUSAN LIBONATI-BARNES

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ARBORETUM BULLETIN

SUMMER 1981, VOLUME 44, NUMBER 2

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COVER
Styrax japonicus in the Arboretum,
a lovely species of *Styrax*
often cultivated in Pacific Northwestern gardens
(see page 9).

Photo: Wm. Eng

Richard van Klaveren Retires

Richard van Klaveren, that knowledgeable and jolly Dutchman who has held forth in the Arboretum greenhouse for the past 19 years, retired in mid-summer this year after a serious illness.

Van, or Dirk, as he was known to thousands of Arboretum visitors and friends, received his training in the great horticultural center of Boskoop, Holland and in England. He emigrated to Canada after World War II where he used his gardening skills at the Gadbous Nursery near Montreal. He then moved to Vancouver, BC and finally joined the Arboretum staff in June 1962 as a nurseryman. He was reclassified to Plant Technician II in 1974 and appointed to the faculty of the College of Forest Resources as Lecturer that same year.

Van's activities encompass many areas including strong church affiliations and activities with the local Dutch community. Professionally, he is a long-standing member of the International Plant Propagator's Society and served in several official capacities for its Western Chapter.

His skills as the Arboretum's propagator, a position requiring encyclopedic knowledge of the field, have been willingly shared with anyone asking for information. Soon after joining the staff, he became involved in the Arboretum's educational program and developed a rapport with his students that continues well beyond the classroom. His public lectures and demonstrations on propagation techniques became highly popular, and Van found his time more and more involved in serving as a resource and information source to the gardening public. In return for this activity, he has received numerous honors and citations. Some are formal and prestigious such as the Horticultural Journalism Award from the Men's Garden Club of America, which he received in 1978. Others are less formal but perhaps more personally satisfying such as the painfully written "thank you" notes he received after sharing his skills with a class for the handicapped.

The responsibility for producing the majority of plants which are added yearly to the Arboretum's collections is the major reason for the existence of the greenhouse, and the greenhouse was Van's domain. It is safe to say that his hands have touched and nurtured 99 percent of the trees and shrubs set out on the grounds over the past 19 years, a not inconsiderable achievement.

Retirement will not bring a complete break in his affiliations with the University and the Arboretum since plans are being made to have him involved in Continuing Education classes in the Center for Urban Horticulture as his health improves.

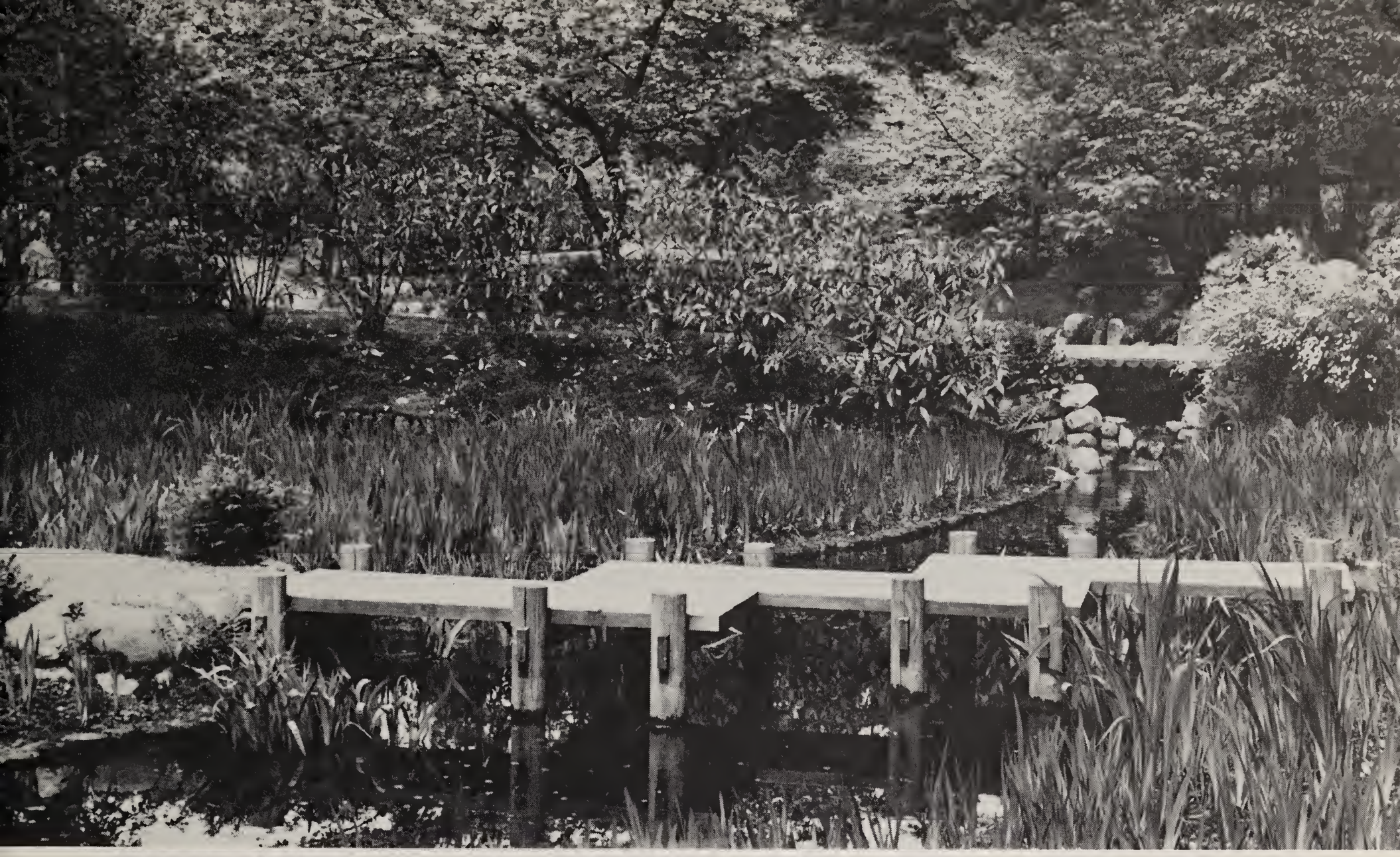
Van and Johanna, his wife, will not lack for interests in retirement. Photography, carpentry, travel, church and community involvements and, above all, gardening will keep him busy. He will be missed by all connected with the Arboretum—staff, faculty and public—and we all wish him continually improving health, many busy and productive years ahead, and continued close contact with the Arboretum.

JOSEPH A. WITT

That time of year . . .
When yellow leaves, or none, or few, do hang
Upon those boughs which shake against the cold . . .

WILLIAM SHAKESPEARE

from *That Time of Year*



The *Iris kaempferi* bed and the Yatsu-hashi Bridge in the Nitobe Memorial Garden (page 5). Photo: Roy L. Taylor

The Botanical Garden at the University of British Columbia

*ROY L. TAYLOR and SYLVIA TAYLOR**

The Botanical Garden at UBC began in 1912 when two acres of land were set aside at the Provincial Colony Farm, Essondale, near New Westminster, for the purpose of providing a nucleus for a botanical garden. In 1916, the collection at Essondale (now Riverview), numbering over 25,000 plants (about 900 species), was transported 25 miles to a permanent 5-acre location at the new University site on Point Grey. The planting of the material was completed by University staff including the secretary of the Botanical Garden, Miss Gruchy, who still lives in Vancouver.

The first director of the Garden was Professor John Davidson, who was a provincial botanist from 1911 to 1916, and was appointed a member of the Biology Department at UBC in addition to his responsibilities for the Garden. He remained director of the Botanical Garden until his retirement in 1945. In 1951 the entire campus was designated as a botanical garden and until 1956 was directed by Dr. T.M.C. Taylor of the Botany and Biology Department of the University. At that time, the Botanical Garden came under the control of the Department of Buildings and Grounds (now Department of Physical Plant)

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The Physick Garden (foreground) and the Arbor Garden in the Main Garden area. The Physick Garden is based on a 16th century engraving of a monastery garden by the Dutch artist van der Heyde. The sundial in the centre was built and donated by a member of the UBC Mathematics Department about 1930 (page 5). Photo: Roy L. Taylor

and was directed by Dr. John W. Neill, Landscape Architect. After an extensive review, the Botanical Garden was redefined in 1966, and a formal departmental status was assigned, under the direct jurisdiction of the President. The present director, Roy L. Taylor, was appointed in late 1968.

The Botanical Garden as organized in 1966 consisted of 78 acres on the campus, including undeveloped second growth hemlock and douglas fir forest with a few older tree species that had escaped selected logging or forest fires. There were also established gardens, that is, Nitobe Memorial Garden, Faculty Club and Graduate Centre gardens, the rose garden and the triangle garden area containing a number of Grieg rhododendrons. In 1975, an additional 30 acres were added to the Botanical Garden. The new areas included the grounds of the previous President's residence, the new Museum of Anthropology, Cecil Green Alumni Park, the Graham House and the areas surrounding Mary Bollert Hall.

The objectives for the new program were redeveloped in 1970 based upon those established by Professor John Davidson when the Botanical Garden was founded. The objectives of the Garden include a) the support of greenhouse facilities and the establishment of plant collections for research in the plant sciences, b) the maintenance of facilities for the teaching and training of graduate students, the propagation of plant material for University and continuing education courses, and the development and participation in gardener training programs, c) the provision for plant display and the development of a public information service.

The ten-year plan for the undeveloped 48 acres of the south campus includes several interesting gardens. The British Columbia Native Garden (8 acres) was dedicated to the memory of Professor John Davidson in 1978. It contains more than half of the 3,500 plant taxa native to British Columbia. A new 2.5-acre alpine garden named for E.H. Lohbrunner, an outstanding grower of alpines in British Columbia, was dedicated in April 1978, by Professor William T. Stearn of the British Museum, London. The alpine garden is organized on a worldwide continental basis. In addition to these two major components, the Main Garden contains a medicalpharmaceutical garden known as the Physick Garden, an Arbor Garden, a Contemporary Garden, and most recently, an Economic Display Garden. There will also soon be an Evolutionary and Systematic Garden arranged according to the system of Cronquist, as soon as planting is finished. Across the Southwest Marine Drive road extension from the Main Garden is a 30-acre Asian Garden, which contains an extensive collection of Asian plants, in particular the genus *Rhododendron*.[1] One part of the Garden will not be developed—the Natural Stand Forest in the south campus, 13.5 acres in extent, which is to be retained as an ecological resource unit for study and research by students and staff at the University.

The detailed landscaping program for the Garden was developed by a team consisting of two members from the Botanical Garden, two members from the Planning Office of the Department of Physical Plant, two landscape architects, and two architects. The development of the Garden over the past ten years has included the establishment of a 5-acre nursery in the south campus, with a new modern propagation facility.

The Upper Campus gardens contain many fine examples of specialized landscaping. The grounds around the Office and Educational Centre have been developed into perennial beds, fruit and vegetable gardens and patio gardens, all of which are used as demonstration

[1]For details concerning the dedication of the Asian Garden and the Physick Garden, see the UW Arboretum Bulletin 44(1):14. Spring, 1981.

areas for local home gardeners, and in addition provide useful material for continuing education programs offered by the Botanical Garden. Our interest in horticulture as therapy for the handicapped and the elderly has led to the installation of a specially designed octagonal greenhouse that was a gift of The Garden Club of Vancouver. The greenhouse has no central support and the benches can be raised or lowered to accommodate those who use wheelchairs.

The Nitobe Garden, designed by Professor Kannosuke Mori of Chiba University to be an authentic Japanese Garden in Canada, and the nearby Rose Garden are the best known areas of the Botanical Garden because they have been established for the longest period of time. The Nitobe Garden was designed to be attractive at all seasons, using local materials wherever possible. Many people find it difficult to decide whether they prefer to visit in the spring when the cherry trees and azaleas are in bloom, in summer when there are many different shades of green and there is a very peaceful atmosphere, or in winter after a snowfall. Every year about 80,000 people visit the Nitobe Memorial Garden between March and October when there is an entrance fee. A large number of people also visit the garden during the winter when entrance is free during normal working hours, but we keep no records on these totals.

The Rose Garden, established in 1959, is used as a display area for modern roses, as well as a test area for roses that might be suitable for the Vancouver area, with regard to blooming display and disease resistance. Every year parts of the Rose Garden are replanted, as unsuitable or old roses are replaced with newer varieties from Europe and a selection of the previous year's All-America winners. There is also a section devoted to miniature roses and one to climbers, and a few blue roses are kept to satisfy a strange liking for them by the Director. This garden also has a fine bent grass lawn. A few years ago during a particularly heavy infestation of crane flies, we were often confronted in the morning with rolled up strips of lawn as a result of raccoons peeling back the lawn searching for the numerous larvae of the insect pest. Fortunately, we have been able to bring the crane flies under control and we no longer have the phenomenon of lawn rolls in the Rose Garden.

The Native Garden in the south campus provides for education, research and enjoyment. In the establishment and maintenance of the garden we are learning about the requirements for the propagation and culture of our native plants. The garden provides an area for the public to see native plants, some of which might be suitable for home gardens as many are grown as ornamentals in Europe, but not here. The garden serves as a refuge for some of our rare or endangered plants and for many species of birds—more than 50 have been identified as regular visitors to the garden, many of them permanent residents or at least nesting in the area. Adjacent to a carefully constructed bog and fen there is a specialized peat bed garden which has become a habitat for peat-loving species. A natural low depression also was enhanced to provide for a fresh water lake which has been the subject of several biological and botanical research projects and yields living material for academic courses in phycology and vascular plant systematics.

A view from outside of a general activity class in the octagonal Horticultural Therapy Greenhouse. Note the absence of a central support, and the way in which wheelchairs can be drawn up to the benches. Photo: Sylvia Taylor

The Physick Garden, patterned after a 16th Century Italian cloistered monastery garden, contains a wide variety of medicinal plants. This garden reflects a long interest in such plants by the Botanical Garden as original research on the genus *Digitalis* was conducted by the Department of Chemistry on plants grown by the Botanical Garden as early as 1922. Specialized labels indicating use of plants in this garden provide much food for thought to the visitor.

The Asian Garden, a 30-acre site, contains the principal *Rhododendron* species collection at the University. The species are loosely grouped according to sections of the genus, although

each species is planted in the best possible growing site. Other significant collections include those of cotoneasters, magnolias, viburnums, Asian conifers, bamboos, maples and woody lianas. Many species from wild sites in China, Korea, Japan and eastern USSR have been incorporated into the collection.

Near the Main Garden Centre is a specialized Economic Garden with a display of All-American annuals, an Arbor Garden, a lawn grass test area, and around the building, a still-developing collection of species of groundcovers not well known in the horticultural trade. A demonstration collection of tree fruits and grapevines completes this area.

The Botanical Garden has initiated many public education programs, which are often run in conjunction with the University's Centre for Continuing Education and involve formal classes and workshops as well as local and overseas field studies. Specialized radio and television information programs such as the 12-week CBC series on British Columbia Gardens supplement a regular phone information service. In late February, the Botanical Garden provides a plant display including extension program offerings, and gives a series of public lectures at the annual Home and Garden Trade Show in Vancouver.

Students wait patiently in the rain for the start of the annual Student Plant Sale organized by the Friends of the Garden, with assistance from Botanical Garden staff.

Photo: Roy L. Taylor

For the past three years we have devoted much educational energy to the use of horticulture for therapy. We have an active program with the School of Rehabilitation Medicine at the University, we serve as resource personnel for community agencies, and conduct classes for extended care patients at the Office and Educational Centre of the Garden. A general two-day symposium was held in 1978, and the Garden will host the Annual Meeting of the National Council for Therapy and Rehabilitation through Horticulture in August 1982. Special consideration has been taken in the gardens to provide reasonable access for the handicapped. A special wheelchair yoke device was developed to assist in the movement of wheelchairs through gardens. These yokes, developed by the Botanical Garden in cooperation with the Bio-Resources Engineering Department at UBC, are now available for use at UBC and at the VanDusen Botanical Display Garden in the city.

The Botanical Garden has recently initiated a Plant Introduction Scheme in cooperation with the British Columbia Nursery Trades Association and the British Columbia Society of Landscape Architects. This program is designed to stimulate interest in horticulturally improved plants for general landscape use. Experts from the industry will select potential material for introduction. The new propagation facility in the Nursery will be utilized for research on the culture and growth of the new introductions. Full use will be made of existing plants in the Botanical Garden, now numbering some 11,000 collections, and of cooperative ventures with overseas clonal selection programs. Other cooperative plant introduction programs are operating with the Vancouver Chapter of the American Rhododendron Society and the Alpine Garden Club of British Columbia.

The Garden continues to provide published information through the release of technical bulletins and through the quarterly journal *Davidsonia*, named after the first director of the Garden. The latter publication, now in its eleventh year, contains horticultural and botanical articles of particular interest to both specialists and the general public of the Pacific Northwest.

To enhance the role of the Garden in the community, a special support group of volun-

teers was initiated, known as the Friends of the Garden (FOGS). The 43-member group provides informed tours for the general public in all Garden areas, and assists in many specialized projects such as the seed exchange program. Perhaps one of the most visible projects has involved the travelling art exhibitions: "Plantae Occidentalis: 200 Years of Botanical Art in British Columbia" and "Cloud Flowers: Rhododendrons East and West". The Friends have produced guides to the trails and a bird checklist for the Garden, and have assisted in the outreach horticultural therapy programs. Each fall a student plant sale of indoor plants is operated by the FOGS. The FOGS have proven to be an innovative support group for the Garden.

The offerings of the Botanical Garden are diverse and varied and one can appreciate the extent of the Garden's role as a public window to the University only by visiting and taking part in the many programs. Gardens really succeed only through dedication of the staff, and we are proud of our staff accomplishments to date. Why not come and visit us soon!

Arboretum Guide Program

By press time, the Orientation Session (September 15), for new Arboretum Guides, will already have taken place. But it is not too late! If we have sufficient demand, we probably can squeeze another into our crowded calendar after the beginning of the year.

Previous expertise is not necessary to become a guide. We will make you expert enough, through our training series, so that you will be comfortable with the groups you will lead through the Arboretum. The schedule for the winter training series, both for Native Walk Guides and for General Arboretum Guides will be published in a later issue.

There will be NEW TRAINING SERIES for General Arboretum Guides and for Native Plant Guides starting in late December and continuing into spring. For further information call Jan Pirzio-Biroli, 543-8800.

In the meantime, don't forget the WEDNESDAY LECTURES in autumn, planned for guides, for future guides and for the public at large.

Time: 10 AM. Place: Montlake Community Center, 16th East and East Calhoun

November 18: "The Holly Collection in the Arboretum" by Virginia Morell, Executive Vice-President, American Holly Society

These lectures will be followed by tours in the Arboretum.

THE NATIVE PLANT GUIDES will have an enrichment class Tuesday, December 8, from 10 AM to noon. Dave Beaton will give hints on how to predict the weather through changes in plants. The class will begin at the Montlake Community Center (16th East and East Calhoun) and will continue with a tour of the Native Trail after the talk, if weather permits. Current guides, prospective guides and visitors are welcome to attend.

For further information, please call Jan Pirzio-Biroli, Naturalist and Volunteer Coordinator, UW Arboretum: 543-8800.

Events of Interest

FINELY HANDCRAFTED TIBETAN RUGS ON DISPLAY through November 25 in the Boiserie, the Cafe on the Court at the Thomas Burke Memorial Washington State Museum, on the University of Washington campus. The Museum Cafe is open daily. For further information please call 543-5884.

THE HOLLY COLLECTION IN THE ARBORETUM, a free lecture by Virginia Morell, Executive Vice-President of the Holly Society of America, is offered at Montlake Community Center, 16th East and East Calhoun, on Wednesday, November 18, at 10 AM.

FRIENDS OF THE CONSERVATORY in Volunteer Park have reserved the afternoons of the second Sundays in each month for special displays. Hours are 1-4 PM, at the Volunteer Park Conservatory. For more information call Priscilla Dickert, 486-3167. November 8— Bromeliads, by Unit 84 of the Arboretum Foundation; December 13— Northwest Orchid Society.

THE PENNSYLVANIA HORTICULTURAL SOCIETY INVITES APPLICATIONS FOR THE J. FRANKLIN STYER AWARD OF GARDEN MERIT. This award is intended to aid both plant introducers and home gardeners in the selection and promotion of ornamental plants with exceptional garden merit. Any person or organization may submit a plant or plants for consideration for the award, which will be made to the plant and not to the introducer. The plants must be hardy in the mid-Atlantic states and should be species or cultivars not widely used for ornamental purposes. Applications can include new plants resulting from selection or breeding, or plants newly introduced to the area from other parts of the USA or abroad. For further information and application forms, contact the Pennsylvania Horticultural Society, 325 Walnut Street, Philadelphia, PA 19106. Deadline is December 1, 1981.

NORTHWEST COAST GRAPHICS comprise the major autumn exhibit for the North Gallery at the Burke Museum. More than two dozen Native American artists are represented in this exhibition of traditional and contemporary silk screen prints.

NOHS LECTURE — Soils Be It: the Root of Everything, January 19, 1982, 10:30 AM, in the McCurdy Room of the Museum of History and Industry. William Shannon, Robert Zasoski, PhD, and Charles Pfeiffer, PhD will present the characteristics of local soils, geology and gardens, and aspects of soil management. This excellent program is repeated by popular demand!

Announcements from the Unit Council

At the annual dinner meeting of the Arboretum Foundation, a presentation of $25,000 was made by the Unit Council to Joseph A. Witt, Curator of Plant Collections, to be used at his discretion. This figure represents the proceeds of the 1981 Plant Sale, a most successful event.

UNIT QUARTERLY MEETINGS are held on the third Thursday of the month, St. Stephen's Episcopal Church, 4805 NE 45th, Seattle, 9:30 AM-12:30 PM, on November 19, 1981, March 18, 1982, and May 20, 1982.

SHEILA TAFT

Styrax japonicus **in the Arboretum (page 11).** **Photo: W. Eng**

The Styrax Family in the Arboretum Part II

BRIAN O. MULLIGAN

As already remarked, this is by far the largest genus in the family Styracaceae, distributed widely throughout the world in three continents but not found in Africa (which is rather surprising, since it occurs around the northern shores of the Mediterranean), or in Australia. It is primarily distinguished from all the other genera in the family, except *Alniphyllum*, by its superior ovary. *Alniphyllum* produces a capsule which splits into five segments, while *Styrax* has oval or oblong nut-like fruits with hard shells.

The Gender of Styrax

Although Linnaeus used neuter termination when publishing the first species of the genus *Styrax* in 1753 (*Styrax officinale*) and was followed by a number of other well-respected botanists including de Candolle (1844), Boissier (1875) and the *Index Kewensis* (1895), he had no precedent for so doing and it is now believed that he was in error (Nicholson and Steyskal, 1976).

Most generic names of trees and shrubs are given the feminine gender, following classical Greek and Roman usage. This rule has been applied to *Styrax*, first by Herodotus in the fourth century BC, but also by several recent authors such as Rehder (1940 and 1944), Fernald, Ohwi, and Chittenden (R.H.S. Dictionary, 1951 and 1956), W.T. Stearn (*Botanical Latin*, 1966 and 1973), and W.J. Bean (*Trees and Shrubs*, revised 8th edition, Vol. IV, 1980).

However, the masculine gender was used for the name *Styrax* by the ancient Greek writer

Plutarch, (120 AD) and then again by Sprengel (1827), a recognized botanist. Hooker and Arnott followed in 1841, as did the monographer of the genus, Janet R. Perkins, in 1907. So there are good authorities and precedents both ancient and modern, for using either masculine or feminine terminations.

In their very thorough examination of this problem, Nicholson and Steyskel (1976) state: "In conclusion, it appears that the classical Greek and Latin gender of *Styrax* was consistently masculine, with the one exception that Herodotus used feminine for the tree . . . The most obvious argument for the use of masculine for *Styrax* is that it is the only gender found in most Latin dictionaries and the predominant gender found in Greek dictionaries." They conclude by accepting masculine as the proper gender to use for *Styrax*, which we are here following.

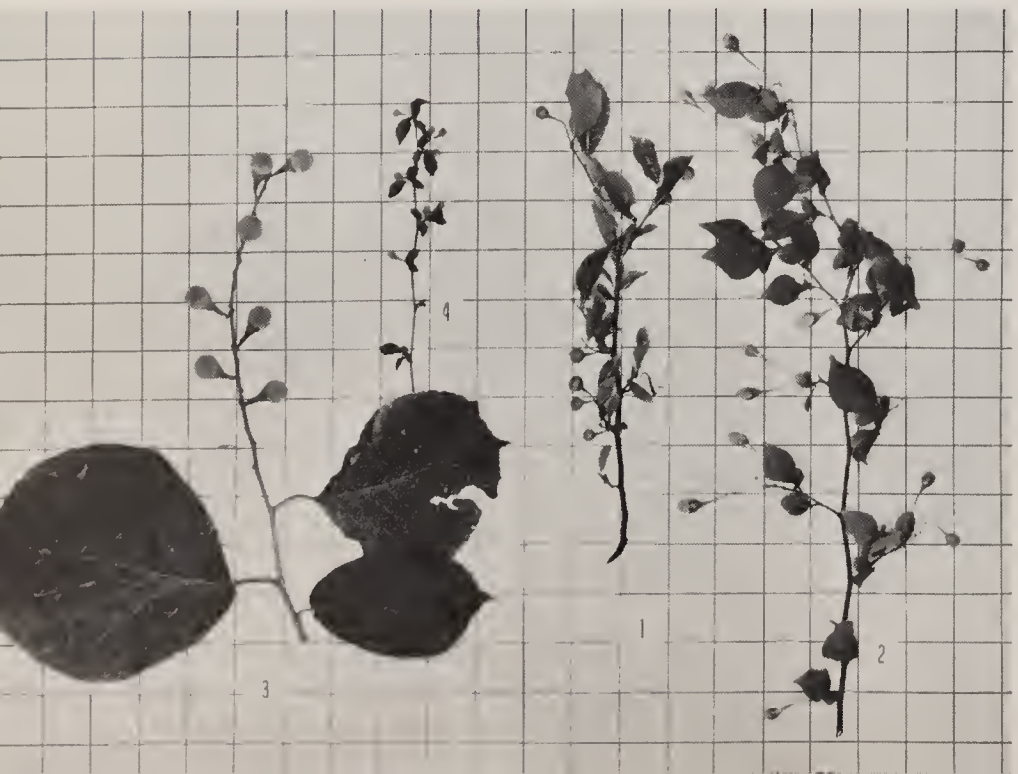
The first species named was *Styrax officinalis*, by Linnaeus in 1753, a shrub or small tree native to the Mediterranean region from central Italy eastwards to Turkey and Syria. *Styrax officinalis*, formerly the source for the gum-resin storax, is also naturalized in the south of France. Surprisingly, an almost identical plant is found in northern California, from Shasta County to Tulare County (var. *californicus*) and the more pubescent variety, *fulvescens*, in southern California.

Styrax officinalis var. californicus

This variety was acquired for the Arboretum from a nursery in California in 1956, then planted three years later alongside the Broadmoor fence just south of Rhododendron Glen. This site, however, has proven too shady, due to overhanging trees, and although the plant has flowered fairly regularly though sparsely since at least 1968, it has not had a chance to show what it could do in a sunnier location. Shade has also affected two other specimens raised from seeds collected by Carl S. English, Jr. in Shasta County in 1965 and planted out ten years later. One of these, only three feet high, was observed to be flowering lightly in late June, 1980.

The branches are slender and brown. The leaves are ovate, 6-8 cm long, 3.5-4.5 cm wide, acute, wedge-shaped at the base, pubescent on the upper side, paler and more densely pubescent beneath, with six to eight pairs of veins. The petioles are about 1 cm long, also pubescent. The flowers, produced in pairs or triads, are bell-shaped, 2 cm long, with five white petals longer than the stamens but shorter than the protruding style; both pedicels and calyx are finely pubescent. Fruits have not been seen here.

Fruits attached to branches of four species of *Styrax:* (1) *S. americanus*, (2) *S. japonicus*, (3) *S. obassia*, and (4) *S. wilsonii*. **Photo: W. Eng**



Styrax americanus

There are several other species of *Styrax* in the eastern and southern USA, including *S. americanus, S. grandifolius,* and *S. texanus*, but only the first has been grown in the Arboretum. In the wild state this is a large shrub of 10-12 feet, or occasionally a small tree of 15-18 feet, which grows on the edges of swamps or on stream banks; its range extends from Florida and Louisiana north to southern Virginia, west as far as southern Illinois, Missouri, and Arkansas (Vines, 1960).

The first planting in the Arboretum, in October 1950, was a single plant raised from seeds sent from a nursery at Houston, Texas. The plant was placed in the bed of *Rhododendron kaempferi* just north of the Winter Garden and close to the *Rehderodendron* planted there a year earlier. It is now a small tree, 22 feet tall. We have no record of its first flowering although it does bloom regularly. The plant is shaded by big-leaf maples and a native hemlock which have probably reduced the quantity of blossoms.

The young shoots are slender, light brown and stellate-pubescent; on the older wood the bark peels off in long fibrous strips. Leaves are thin, ovate or obovate-elliptic, 10-12 by 5-7 cm, acuminate at the apex, cuneate at the base and tapering to the petiole. The leaf margins are irregularly serrulate with glandular teeth, ciliate,

with six to eight pairs of veins which are prominently raised beneath and pubescent. The stellate-pubescent petioles are up to 1.5 cm long.

The fragrant flowers appear in early June, borne on very short stalks in racemes of up to four. The pedicels and calyx are pubescent. The five petals are white, spreading open but reflexed at the tips, 1.7 cm long, longer than the stamens. The finely pubescent subglobose fruits which ripen in October are 5-7 mm in diameter.

The second source for *Styrax americanus* was the Morton Arboretum, Lisle, Illinois, whence seeds were received in February 1950. A plant raised from these was set out in April 1957 in the border against the Broadmoor fence, south of Rhododendron Glen. The plant was lost, perhaps because the site was too shady for its well-being. It may be that *Styrax americanus* has not really had adequate trial in the Arboretum and should be planted again in more open situations. *Styrax grandifolius* would also be a desirable acquisition, since it possesses longer racemes of larger flowers than the former species, but should be obtained from Virginia (the northern part of its range) if possible.

Styrax japonicus

The most commonly cultivated species of *Styrax* in the Puget Sound region is *Styrax japonicus*, which has an extended natural distribution from Korea through northeastern and central China, the whole of Japan and south to Taiwan and the Philippine Islands (var. *kotoensis*). In view of this wide range it is rather surprising that there is not more variation evident in our garden plants, although some does appear even in the Arboretum's small collection.

The first seedlings of which we have any record came in March 1939 from the large old plants still existing in the Drug Plant Garden and along Stevens Way near Anderson Hall, at the University of Washington. At least three of these were planted in or before 1945 on the west side of Azalea Way, about midway along its length; two were removed in 1955, the site proving too wet for them. The remaining one, now 22 feet in height, flowers and fruits freely each year.

In 1949, three eight-foot plants, probably 10-12 years old, were acquired from the Bonnell Nursery in Renton. They were all planted in December that year on the south bank at the west end of Woodland Garden where they have

***Styrax obassia* (page 12).** **Photo: D. Normark**

flourished and now flower and fruit profusely; they vary from 17 to 22 feet in height, with trunks four inches in diameter. Shade from tall native maples (*Acer macrophyllum*) and a hemlock does not seem to affect their blooming capabilities in the least.

In 1954 the Arboretum received seeds of *Styrax japonicus* from the garden of the Royal Horticultural Society, Wisley, Surrey, England. Plants were raised from these, and in October 1957 one was placed in the border allotted to members of this family, facing the head of Rhododendron Glen. In April 1959 two more plants were put into a bed between Azalea Way and the oak collection, at the north end of the Arboretum. By June 1968 these all had grown considerably and constituted an effective floral display. The record card for these plants states, "This is an exceptionally fine form of the species, having often 6 to 7 flowers in the inflorescence, each. . . 3.0 to 3.5 cm wide, with a pale pink flush at the base of the petals. All three plants are similar." The pedicels are 2 to 3 cm long, glabrous like the calyx cup. The small sepals have an apical tuft of hairs while the style is glabrous and 2 cm long. The leaves are elliptic, ovate, or obovate-elliptic, 9 to 12 cm long, 5 to 6 cm wide, acuminate, cuneate and decurrent at the base, glabrous except for small tufts of hairs in the axils of the four or five pairs of veins beneath. The leaf margins have a few small glandular teeth especially in the apical half. The petioles are 6 to 10 mm long, sparsely glandular and stellate-pubescent. The ovate fruits, which ripen in October, are 11 to 12 mm long, 9 to 10 mm wide, mouse brown, with the pericarp covered by minute stellate hairs. The single seed is elliptic, 9 to 10 by 5 to 6 mm, brown, with three longitudinal ribs.

There are two varieties of *Styrax japonicus* that have larger leaves and flowers than the type, namely var. *kotoensis*, which is more southerly in its distribution and therefore unlikely to be hardy here, and var. *jippei-kawamurae* from the Izu Islands, Honshu, Japan, located in the Pacific Ocean south of Tokyo Bay. Without comparing our plants with authentic specimens of the latter it is inadvisable to assign that name to them.

Styrax obassia

Styrax obassia is the second most frequently grown species of *Styrax* in the Pacific Northwest. The name *obassia* was transliterated from a Japanese native name by Siebold and Zuccarini in 1835. Like *S. japonicus*, it is found wild in both Japan and China. In China, *S. obassia* occurs in two or three of the eastern provinces, whereas in Japan it is found on all of the main islands, from Hokkaido in the north to Shikoku and Kyushu in the south. *Styrax obassia* also occurs in Korea and Manchuria. It was introduced from Japan to England by Charles Maries in 1877, working on behalf of the famous Veitch Nursery. Fortunately, Maries collected material from Hokkaido, which probably was a hardier stock than plants from the southern islands.

Leaves of young *Styrax obassia*, some reaching 9 inches long. Photo: B.O. Mulligan

Styrax obassia, with its few, stout branchlets, is a much sturdier tree than *S. japonicus*, in which the terminal twigs are very thin and slender. When one compares the size and weight of the foliage in each species, as well as the long flower racemes of *S. obassia*, its sturdier construction is seen to be an advantage. The translucent leaves are more or less ovate, generally 12 to 15 cm long, 8 to 11 cm wide, short-acuminate at the tip and varying from wedge-shaped to blunt and rounded at the base. The upper side of the leaf is dark green and glabrous, the lower covered with a thin gray stellate pubescence, and with 8 to 10 pairs of raised veins. The base of the stout petiole completely encloses the bud, a feature unusual in this genus but also found in *S. shiraianus*. The chocolate brown bark peels off gradually with age.

On branches of the previous year's growth, in late May and early June, racemes of fragrant flowers appear. These may be as much as 20 cm long, each bearing up to 30 open-campanulate blossoms 3 cm wide when fully open. The five or six petals, divided almost to the base, are much longer than the stamens and about as long as the style. Both pedicels and ovary are appressed-pubescent. The scent of the flowers resembles that of some of the mock oranges (*Philadelphus*). The oval to subglose fruits, distinctly larger than those of *S. japonicus*, are 14 to 16 mm long and 13 to 15 mm wide, and are covered by a fine silky pubescence. They mature in October and November.

The earliest planting of *Styrax obassia* in the Arboretum may be contemporary with the plant of *S. japonicus* which came from the Drug Plant Garden in 1939. It is a single tree now 30 feet in height which has done reasonably well in that rather damper site and heavier soil than our other examples have had to tolerate. Two plants grown from seeds received in 1941 were placed in October 1949 in the bed of *Rhododendron kaempferi* just northwest of the Winter Garden, not far from our original *Rehderodendron* plant. By 1973 one of these had attained about 30 feet in height, with two main stems, but the following year it was broken off at ground level by an

Styrax hemsleyanus. *Photo: B.O. Mulligan*

unusually wet and heavy snowfall on December 26th. The second tree was 33 feet tall in 1973; it is now up to 41 feet and was in full bloom at the end of May 1980. It is surrounded by native evergreen trees and hence considerably shaded, which must largely account for its greater height attained in a shorter time than the specimen beside Azalea Way, which is open to full light and sunshine on the south and west sides.

Another plant given to the Arboretum in February 1950 by the late Donald Graham of Broadmoor, Seattle, was planted in November of that year in a new bed adjoining the east boundary fence, just north of the parking areas facing the head of Rhododendron Glen along Arboretum Drive. This tree likewise possesses a double stem, a feature which should be eliminated by pruning when the plants are young. By 1973 it was 27 feet tall, again in a site shaded by native evergreen trees to the south and north but open to the west, in very sandy and well-drained soil. The tree, now 33 feet tall, flowers regularly and freely each summer.

Styrax obassia is an excellent small flowering tree for this region. Although its large heart-shaped leaves are rather coarse, they provide some yellow color in October before they fall. Propagation is best accomplished by sowing seeds in late fall or early winter. The seeds can be planted in a pot that should then be plunged in the ground or kept in a frame until the seeds germinate.

Styrax hemsleyanus

This wholly Chinese species was named for W.B. Hemsley, a leading botanist at the Royal Botanic Gardens, Kew, London, until his death in 1924.[1] *Styrax hemsleyanus*, known only from three northern or central provinces of China, was discovered by Augustine Henry in 1888. It was first introduced to England by E.H. Wilson in 1900 and flowered there in the Veitch Nursery in 1909. Our plants were raised from seeds received from Mr. F.J. Williams of Caerhays Castle, Cornwall, England, in December 1960, where I had seen it earlier that year. Two plants were set out five years later in the border beside the Broadmoor fence, south of Rhododendron Glen, between the two trees of *Ptersostyrax hispidus*. Since this site is also shaded on the east by native alder trees, the *Styrax* plants have flowered regularly although not freely for a number of years. Plants left in the nursery bloomed in June 1970 and produced fruits later that year. The two planted out are now 9 and 20 feet tall, the great difference in height probably due to the relative amounts of light received by each.

The stiffly upright habit, and the branching pattern with a strong central stem are very similar to *Styrax obassia*. The ovate to obovate leaves may be as much as 15 cm long and 10 cm wide, translucent, acuminate at the apex, tapering to the base, finely serrate on the margin, stellate-pubescent only on the prominently raised veins beneath, of which there are 5 to 6 pairs. The petioles are 1.0 to 1.5 cm long, but not enclosing the dark brown pubescent bud. Flowers appear in early June, borne in dense panicles at the ends of leafy branches. The panicles are 9 to 12 cm long, each with 6 to 16 sweetly fragrant, campanulate, white flowers about 1.5 cm long. The spreading petals, divided to the base, are longer than the stamens and style. The peduncles and pedicels are finely pubescent, and the calyx is covered with brown stellate hairs. The fruits are subglobose, 8 to 9 mm long and wide, densely tomentose, often with a persistent style. Seeds are oval, 7 to 8 mm long and 6 to 7 mm wide.

At Echo Glen, near Preston (about twenty miles east of Seattle) the local climate is both wetter and colder than that of the city. For ten years *Styrax obassia* and *S. hemsleyanus* have been growing adjacent to one another in an open site there. The former has reached 17 feet in height, the latter 12 feet; both were flowering in June 1980 and have done so in previous years.

[1] See UW Arboretum Bulletin 42(3):8. Fall, 1979.

An Arboretum plant growing under the name of *Styrax hemsleyanus* was raised from seeds received in November 1948 from the nursery of W.J. Marchant in Wimborne, Dorset, England. Now a vigorous, upright, small tree of 23 feet, it was planted in November 1956 in the border facing the head of Rhododendron Glen beside Arboretum Drive. Judging from various characters of both foliage and flowers this appears to be a natural hybrid between *S. hemsleyanus* and *S. obassia*. It is similar to both species in appearance and flowers regularly for us, in early to mid-June.

Styrax shiraianus

This is by far the rarest of the three native Japanese species, being found in the mountains from central Honshu southwards, where it becomes a large shrub. It was first described by Makino in 1898 and is said to have been introduced into the USA in 1915.

Seeds were obtained for our Arboretum in February 1966 from the Municipal Arboretum at Kobe in southern Japan. Plants were successfully raised from these and three set out almost ten years later, in Janaury 1976, when they were three to four feet tall. They were planted in a prepared bed on the west side of Arboretum Drive, opposite the Maude Sawyer memorial fountain. This site was considerably shaded by various native trees, but receives enough light to allow for normal healthy growth. Unfortunately one plant was stolen three months after planting; the other two are now 9 and 7½ feet in height, upright in habit and with a central leader, much like a less vigorous form of *Styrax obassia*. Although in five years they have approximately doubled their height, they remain slender. A fourth plant, now seven feet tall, was placed in a shaded site in the border beside the east boundary fence south of Rhododendron Glen, where it consequently flowers very sparsely.

The young shoots of *Styrax shiraianus* are thinly stellate-pubescent, the bark brown and peeling off in the second year like that of *S. obassia*, but the branches more slender than those of that species. The leaves are obovate and usually tapering sharply to the base, the smaller ones rounded. In texture, the leaves are thin but tough, up to 9.0 to 10.5 cm long, 7.0 to 8.5 cm wide, the apex acute and very prominently dentate, only serrulate toward the base. The leaf surfaces are roughly pubescent, with 5 or 6 pairs of raised and stellate-pubescent veins beneath. The short petiole, also stellate-pubescent, is 1.0 to 1.5 cm long, enlarged at the base, and encloses the bud as in *S. obassia*. The first flowers were seen on a plant in the nursery in early June 1974. These are borne on last year's branches in short leafy racemes up to 5 cm long. The flowers are clustered closely together, lack any scent, and are tubular-campanulate. The five white petals spread outwards towards their tips, are divided for about half their length, and are longer than the stamens. The calyx is alomost 1 cm long, whitish pubescent but with scattered brown stellate hairs, the style is often hooked at the tip. The fruits ripen in mid-to late October, with four to eight per raceme. Fruits are oval to almost globose, 8 to 12 mm long, 7 to 9 mm wide, densely covered with a thick tomentum, the style often persisting in a dried condition.

Styrax shiraianus is a distinctive smaller species but not to be compared with either *S. obassia* or *S. japonicus* in garden value, though most resembling the former. The lack of fragrance is its major drawback.

Styrax wilsonii

Some mention should be made of this shrubby species from western Szechuan, China. It was introduced by Wilson in 1908 when he was collecting for the Arnold Arboretum, and it first flowered at the Royal Botanic Gardens, Kew, at the tender age of 17 months.

The branches are very slender, like those of *S. japonicus*, but both leaves and flowers are very much smaller than in that species. The leaves are 2 to 3 cm long, with a few teeth in the apical half. The two pairs of veins are raised on the underside of the leaf, which is covered with a close, white felted tomentum. In mid-summer, from 2 to 5 fragrant flowers are produced on very short pendent racemes, on short lateral branches from last year's shoots. The flowers have five petals, 8 to 10 mm long, spreading widely; both the calyx and ovary are stellate-pubescent, the hairs of the calyx golden.

Seeds reached this Arboretum in March 1941 from an unrecorded source. Six plants were raised from them; two survived to be planted in April 1947 "at the top of Rhododendron Glen." No further history of these can be traced in our records, but in May 1953 two more were set out

in the border beside the east boundary fence, opposite the head of the Glen, a rather shady site because of the native alders behind them. Flowers were observed the following July, and again a year later at the same season; in 1961 in mid-June and 1971 in late June. However, four years later these two plants had died, perhaps from being crowded and shaded by adjacent shrubs and trees. The fact that they survived the abnormal early freeze of November 1955 speaks well for their hardiness in Seattle. This species should be reintroduced to the Arboretum and given a sunnier position, as well as tried elsewhere in the region. It would be a good substitute for *S. japonicus* where space is limited.

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James Clark Joins the Center for Urban Horticulture

Dr. James Clark has joined the faculty of the Center for Urban Horticulture as Assistant Professor of Environmental Horticulture. He will be responsible for graduate teaching and for research on growth of plants in urban environments. He will pay particular attention to solving the practical problems facing those who utilize and maintain plants. One of his projects will be to devise computer models of tree growth to predict growth in specific landscape sites.

Dr. Clark is from New Jersey where he received his BS and MS degrees at Rutgers University. He carried out his PhD work at the University of California, Davis, where he investigated the influence of cytokinins on juvenility in *Hedera helix*, ivy. He then joined the faculty at Michigan State University for two years where he was responsible for teaching plant propagation and other aspects of nursery management. At Michigan State, Clark was selected to participate in a university leadership training program for young faculty. He recently has received a grant for research on shade trees from the International Society of Arboriculture.

James Clark and his wife, Gretchen, bring a spirit of enthusiasm to the Center and we welcome them to horticulture in the Pacific Northwest.

H.B. TUKEY

Hybrid Alstroemerias

The *ligtu* hybrid alstroemerias are colorful perennials that thrive in sunny locations. They grow from underground fleshy rhizomes. The leaves on the stems have a somewhat twisted appearance and give the plant an attractive pinwheel effect. The spectacular long-blooming flowers open mid-summer and occur in a wide range of colors including cream, gold, soft shell pink, deep watermelon and flame. The petal markings tend to be variable. Each stem produces a large number of flowers which last a long time when cut. Alstroemeria roots are very fragile and grow deep in the soil, enabling the plant to survive in very dry places. It is best to buy starts in pots because it is almost impossible to successfully divide established plants. Once planted, alstroemerias should never be disturbed. Allow a foot to eighteen inches between plants. Be sure that the soil is both light and well-drained. Once established, alstroemerias will increase in strength, size and beauty each year.

ELEANOR CARNWATH

Pine Drops, a Welcome Parasite

This autumn we were excited to find the beautiful stalks of *Pterospora andromedea,* pine drops, an unusual member of the Ericaceae. This intriguing plant lacks chlorophyll, a green pigment which enables plants to manufacture sugars from sunlight and air. Therefore, *Pterospora* must acquire nutrients from living or dead parts of other organisms. The roots of *Pterospora* are always enveloped by fungal hyphae, which may be the means of transferring nutrients from the nearby coniferous trees. *Pterospora* grows in the shade of dry coniferous forests, such as the one where it was found around 4,000 to 5,000 feet at Souk Pass in the mountainous area near Wenatchee. There were ponderosa pines there, as well as Douglas firs. The tall reddish stems of *Pterospora* are sticky to the touch, due to the yellowish glandular hairs. The urn-shaped drooping flowers are reddish like the stems, but appear yellowish when viewed from below. The apt name *Pterospora* describes the minute winged seeds, from the Greek *pteron* for wing, and *sporos* for seed. The spherical seeds have a broad white net-like wing at one end, which can be seen with the aid of a handlens. An immediately available fungal associate may be required to provide nutrients for seed germination, and then later to transfer nutrients from pine trees to pine drops. In this sense then, pine drops are drops from pine! We are looking forward to our next encounter, in late summer or autumn, with these denizens of our montane forests.

LOIS PRESTRUD

The scenic splendor of Lake Wakatipu near Queenstown (page 21). **Photo: G. Pirzio-Biroli**

Springtime in New Zealand — Part II

The Arboretum's Horticultural Tour

October and November 1980

JAN PIRZIO-BIROLI

If our first week in New Zealand constituted a crash course in the unusual flora of this island country in the Southern Hemisphere, it also gave us time to absorb the anomalies presented by elaborate, European-style gardens, the man-made agricultural scene and the carefully preserved areas of native bush. These themes continued to present themselves with variations dependent upon the history, the geography and the latitude. The latitudes between Auckland on the North Island and Invercargill at the southern tip of New Zealand correspond roughly to those between the Monterey Peninsula and Seattle.

New Plymouth

New Plymouth lies between 39 and 40 degrees south latitude, more or less analogous to that of Fort Bragg in Mendocino County, California. Furthermore, it is subject to westerly winds that bring heavy rainfall. These conditions combine to make possible the lavish growth of warm-temperature plants as well as many of the horticultural subjects we enjoy in Seattle. This city of less than 50,000 persons boasts a wealth of attractions for plant lovers, which we were able only to sample, for our sojourn there was limited to one day.

We began the morning with a two-hour visit to the Duncan and Davies Nursery, a wholesale company which ships to a network of representatives all over the world. Mr. Bill van Dyk showed us the huge fields of two-year-old rhododendrons. Duncan and Davies grows an enormous number of different kinds, mostly hybrids. We saw a mixture of choice plants, including selections of native materials, the exotic banksias and proteas, and the brilliant Ilam hybrid azaleas (the New Zealand counterpart of the Exbury and Knap Hill deciduous hybrids from England).

Some of their younger propagations were protected from the summer sun by canopies of young albizias (silk trees). The extensive greenhouse facilities were modern and immaculate. During the cutting season, 12 persons are employed to make about 110,000 cuttings. A big operation!

In contrast to this efficient commercial establishment, our next visit was to Pukekura Park, reputed to be the most magnificent public park in New Zealand. The large artificial lake is crossed by a picturesque red footbridge, reminiscent of certain kinds of Japanese gardens, while at its far end Mt. Egmont provides borrowed scenery. The lake is surrounded by native and horticultural varieties of trees and shrubs, as well as large rhododendron plantings. There are four conservatories (the New Zealand "winter gardens"), connected by tunnels of greenery. The Tea Kiosk, our luncheon stop, is a typical Victorian structure, so popular in parts of its era.

Next we visited Tupare, an 8½-acre private garden built on the side of a steep ravine. Paths lined with garden treasures wind down to the tudor-style house and outbuildings at the base of the hill. Rhododendrons are massed beneath conifers and deciduous trees from East Asia, America and Europe, as well as handsome native specimens. This garden is owned by Mr. and Mrs. Russell Matthews, who were among the founding members of the Pukeiti Rhododendron Trust.

The 15-mile drive to Pukeiti climbed the low mountain ranges that form the base of Mt. Egmont, winding along narrow, wooded roads with occasional homes set back among the trees. Since Pukeiti has been described in detail by Edward Dunn in the previous issue of this *Bulletin*[1], only a brief mention of our own impressions is warranted here. First, there was the cordial reception by its Director, Mr. Graham Smith, and the comprehensive tour he gave us in the brief time allowed for this very special place. The beautifully manicured lawns and rhododendron gardens near the main buildings were in striking contrast to the tree-sized rhododendrons growing within the bush in the outer reaches of Pukeiti. There was the charm of the native bush itself; we, too, were impressed with the giant Rata tree (Mr. Smith's young daughter climbed in and around the narrow openings between its buttressed roots). We were especially impressed by the phenomenal development of this garden over a period of only 30 years, encouraged to a large extent by the dedicated volunteers who give the first Saturday in each month to its maintenance, and hastened by the prolific rains. The growth of the garden has been hindered to some extent by the proliferation of opossums, one of the many introduced mammals that have outgrown their welcome in New Zealand.

Often, since we have returned from New Zealand, we have talked about the things we might have done differently, and we have always agreed that New Plymouth should not be visited by plant lovers in one day. There are too many beautiful gardens in which to spend more time. Edward Dunn regretted that he had had only three days in Pukeiti; we had only two hours!

En Route to Wellington

Next day we set off to Mt. Egmont on one of our last days in the North Island. Whereas our visit to Pukeiti occurred a short time after the height of its season of bloom, we were at least several weeks too early to enjoy the alpine areas of this great volcanic peak. The flora was, as usual, quite different from our own; but without flowers it was impossible to identify many of the new plants we saw.

In the afternoon we visited the Bushy Park Scenic Reserve, an extraordinary combination of native bush forming the background for a formal, turn-of-the-century country mansion, surrounded by sweeping lawns. Those of us

The interior of a greenhouse at Duncan and Davies Nursery, New Plymouth. Photo: G. Pirzio-Biroli

[1] *UW Arboretum Bulletin* 44(1):31. Spring, 1981.

who had not yet had our fill of the bush ignored the civilized aspects of Bushy Park and headed for the fragment of warm-temperate rainforest that had been set aside in 1892 by a farsighted New Zealander named Frank Moore. In this dense mass of vegetation, trunks of various species grew side-by-side, entwined with lianes draped from their upper branches. The light filtered through a canopy high above our heads. We emerged from this jungle at the edge of a typical close-cropped, emerald pasture with black sheep grazing below a turreted house. After a brief visit to the old homestead, we boarded the bus once more for the 125-mile journey to the port city of Wellington.

Wellington

This beautiful city is built on the steep southwestern slopes sheltering a large harbor, Port Nicholson, at the southern tip of the North Island. Despite the protecting hills, 135-mile winds from the Cook Channel are not uncommon. Wellington, capital of New Zealand, is known as the "windy city". It was the home of Katherine Mansfield and the setting for some of her most famous stories.

The Botanical Gardens are situated in a 62-acre portion of the extensive Town Belt surrounding Wellington. Upon entering at the top of the garden, one wanders down through impressive collections of magnolias, rhododendrons and camellias with tulips and bedding plants in the open areas. Halfway down the hill is a large rock garden containing such plants as dwarf forms of New Zealand flax (*Phormium* cvs.), *Pimelea prostrata* and *Ficus pumilus* 'Minima'. The latter can grow unprotected here, for despite the winds, frost is not a limiting factor in Wellington. In the flat area at the bottom of the hill, the Lady Norwood Rose Garden is laid out in a great circle before the impressive "Begonia House".

Since the afternoon was free, we rented a car to visit the eastern shore of Port Nicholson. We were lucky to walk along the beach at low tide, for the varieties of sea life were as numerous and strange to us as the terrestrial flora of New Zealand. We noticed many people collecting "Paua", the univalve which resembles abalone and is valued not only for its delicate flavor but also for the iridescent blue lining of its shell that is used to make a multitude of New Zealand souvenirs.

Next morning, at the Otari Plant Museum, we were met by its Director, Mr. R. Mole, who was trained at Kew and spent some time in Rhodesia before coming to Otari 18 years ago. He explained something of the history and situation of Otari before showing us the garden. This comprehensive collection of New Zealand plants was the dream of Dr. Leonard Cockayne, a famous New Zealand botanist of the early 20th century, whose grave is in the garden. He not only collected in the wild but also made selections of native New Zealand plants. For example, the dwarf sophoras have been circulated by Otari because their one- to two-meter size is useful for small gardens. Mr. Mole also emphasized the fact that wind is a limiting factor in Wellington gardens.

Otari has a comprehensive collection of *Hebe*, the shrubby veronica whose nearly 100 species are endemic mainly in New Zealand. Hebes occur in several growth forms and range from low varieties to some that are 25 feet tall. The wide range of variation in these many species is due to adaptive radiation—the result of the ability of hebes to mutate and to hybridize for adaptive purposes to fill a wide variety of environmental niches.

We spent a pleasant hour in the five acres of cultivated garden, a rock gardener's paradise, and then we toured the wilder areas, which consist of two ridges. One of these is cutover land, presently covered with the introduced weed-shrub, gorse (*Ulex europaeus*). The gorse eventu-

Trunks and lianes in the rainforest of Bushy Park Scenic Reserve. **Photo: J. Pirzio-Biroli**

ally will become overgrown with whitey-wood (*Melicytus ramiflorus*, an arboreal violet). Ten or twelve years later the area will become overtopped with the native bush. *Knightia excelsa*, a relative of *Protea*, is likely to dominate the young bush. It can become 80 to 90 feet tall and survives because it is not eaten by opossums. The second ridge is a well-preserved section of bush with Rimu (*Dacrydium cupressinum*) and a 75-foot tall canopy of *Beilschmiedia tawa*, especially dominant in later succession because of its shade tolerance. Numerous lianes and epiphytes grow on these trees, and there is a groundcover of ferns.

Mr. Mole provided us with such a wealth of insight into the flora of New Zealand that we were reluctant to leave Otari. However, we were due to board a plane for Christchurch on the South Island that afternoon.

Christchurch

The contrast between the rugged hills of Wellington and the gentler, nearly flat landscape of Christchurch is striking. It is situated about one-third of the way down the eastern (drier) side of the island at the edge of the extensive Canterbury Plains. A ridge of low hills lies directly south of the city, and the snow-covered peaks of the Southern Alps are visible on the western horizon. The River Avon winds through the city,

Many New Zealand plants are both endemic and dioecious (with different sexes on separate plants) as is this female *Clematis paniculata*. **Photo: G. Pirzio-Biroli**

enclosing the Botanic Garden on three sides with a narrow loop. The handsome wrought iron gates of the garden stand at the entrance to this loop next to the Canterbury Museum. Upon entering the garden, one's first impression is of the great age of its enormous trees in a park-like setting. The Curator, Mr. Jolliffe, told us something of the history of this garden, which is ranked among the ten best botanic gardens in the world. Its excellence is due to several factors: first the foresightedness of its founders, who began the garden less than 20 years after the establishment of Christchurch; second, the age of the garden (about 117 years); and third, the favorable climate. The first recorded tree planting was in 1863, but even a purple beech (*Fagus sylvatica* 'Purpurea') planted in 1920 now has a six-foot trunk diameter and a 45-foot spread of limbs. There are Lebanon cedars (*Cedrus libani*) that were planted in the 1880's and 1890's.

The botanic garden at Christchurch is now managed by the city's Parks and Recreation Department and has a staff of over 35 persons. About 2,000 species of plants are introduced each year through their seed exchange with 500 institutions throughout the world.

The maritime climate is responsible for the moderate temperatures. Within the garden there are microclimates where there is no frost and the proteas from South Africa can be grown. Mr. Jolliffee showed us a 350-foot perennial border, a primula garden, a rock garden which is still in the expanding phase, and a native plant garden which has over 120 different kinds of hebes, collections of *Leptospermum* hybrids, of phormiums (the New Zealand flax) and of olearias, to mention only a few genera.

Outside the garden, we wandered along the banks of the Avon, an intimate stream which lends great character to the city. Private gardens are cultivated down to the river banks. Oaks and willows hang over the water.

We took lunch at the Sign of the Takahe, a restored tudoresque mansion in the hills south of the city. The walled garden offered extraordinary views of Christchurch and the Canterbury Plains. Among the interesting plants grown in this protected environment were three-foot specimens of an *Echium* species with tall spikes of brilliant blue flowers.

A few of us spent an interesting hour that

afternoon with Mr. Bill Sykes of the Agricultural Research Centre for Canterbury in Lincoln, about 15 miles southwest of town. Opened in 1880, Lincoln College was one of the world's earliest schools of agriculture. This is the center for taxonomic research in botany in New Zealand.

Mr. Sykes, specializing at present in the poplars and willows, is cooperating with other members of the staff on the fourth volume of the New Zealand flora. This volume will deal with the weed flora of New Zealand. Mr. Sykes stressed that for the most part the weeds of the North and of the South Island are different species. Guava has become a nuisance, as has the African olive, which was introduced in the 1830's. About eight taxonomists are working on this project with back-up from two palynologists, an anatomist, a cytologist and an ecologist.

The Centre, which has no students and has nothing to do with crops, has an herbarium of half a million species and exchanges with the Smithsonian, the University of Hawaii, the New York Botanical Garden and the Missouri Botanical Garden. Our tour of the facilities included a visit to the greenhouses and shadehouses, where we saw some of the interesting plants (not all weeds!) that members of the staff are working with. These projects included the cytology of the podocarps, work on *Carmichaelia* (a New Zealand broom), on celmisias, on *Nothofagus solandri*, on a coastal form of *Sophora tetraptera* with divaricating branches, and on the eco-taxonomy of *Pachystegia insignis*, a handsome New Zealand shrubby daisy, which the resident ecologist believes should be split into several geographic races.

Unfortunately, most of my black and white film from this extraordinary day was lost through inexperience with a new camera.

Mount Cook and the MacKenzie Country

Next day we crossed the Canterbury Plains to the tussock grass country of the MacKenzie Valley. Here, for the first time we saw agricultural land that had not been turned into green pastures. These snow grasses, as they are also called, are native and grew more than head-high when the early settlers arrived. The settlers burned them off several times to reduce their height for grazing purposes, and now they form one- to two-foot mounds of slender brown leaves that bow before the wind, extending for mile upon mile through rounded hills and narrow valleys.

Tussock or snow grass, *Chionochloa flavescens*, near Lindis Pass, typical of the MacKenzie grazing country.
Photo: J. Pirzio-Biroli

The area is laced with glacial lakes, which are being developed for power and irrigation. To reach Mt. Cook, we drove along Lake Pukaki and the Tasman River, derived from the snowmelt coming off New Zealand's tallest mountain (3762.9 m) and the peaks associated with it.

In the late afternoon, we arrived at the Hermitage, a luxurious hotel on the southern flank of Mt. Cook. The sky was bleak, and the mountain shrouded in clouds, but some of us set off toward Kea Point to see as much of the flora as an hour would allow before the light became too dim for photographing. We saw numerous alpine plants, especially the divaricating shrubs that can only be identified if they are flowering (and some of them were). A few hundred yards short of trail's end, we found what we had hoped to see—the giant white buttercup, *Ranunculus lyallii*, looking strangely out of place in this inhospitable setting with its fragile petals and large glossy leaves.

Next morning we retraced our route down Lake Pukaki toward Queenstown on Lake Wakatipu near the fjordland of southern New Zealand. A stop for photographs at Lindis Pass revealed rock-garden miniatures such as *Pimelea* and *Raoulia* species growing among the tussocks. Lindis Creek fell away below us at the foot of the valley. The tussock grass was intermixed with "wild Irishman", a thorny divaricating shrub. The divaricating species became more numerous as we continued down the valley, but ultimately they gave way to willows in the creek bottom.

Queenstown is a New Zealander's tourist

Clockwise from upper left: The beech *(Nothofagus trun*
(page 24; G. Pirzio-Biroli). The well-loved seals in Que
tenax, New Zealand flax, in the Botanic Garden at Quee
lyallii, the great mountain buttercup, high on Mt. Cook n
Plymouth, with its lavish growth of warmth- and moistu

) forest at the end of Lake Wakatipu, near Queenstown
Park, Invercargill (page 25; J. Pirzio-Biroli). *Phormium*
ark, Invercargill (page 25; J. Pirzio-Biroli). *Ranunculus*
ea Point (page 21; J. Pirzio-Biroli). Pukekura Park, New
ving plants (page 18; J. Pirzio-Biroli).

town, and we were there on Sunday when most of the shops were closed. In the afternoon we drove up toward the northwest end of Lake Wakatipu, watching civilization retreat behind us. Whereas, at the beginning of our drive, the flora consisted mainly of introduced species, it contained an increasing number of native species bordering the rich farmland along the lake. Ultimately we reached a beech forest (*Nothofagus truncata*) whose floor was covered with mosses and numerous seedlings from the parent trees. In the road cuts of this magical place grew at least five species of miniature ferns.

Milford Sound

The weather had favored us during most of our time in New Zealand, but Monday arrived cold and drizzly. After a wet cruise up the lake to visit a sheep ranch, we drove to Te Anau, the gateway to Milford Sound. Here we were told that we would not know until the next morning whether we would be allowed to make the journey into the Fjordland of the west coast, for avalanches had trapped two busses that day. Milford Sound experiences 500 inches of rainfall per year, and in early spring (at the beginning of November) more than a little of this falls in the form of wet snow. Nevertheless, we were lucky to be among the few busloads that set off for Milford, arriving about noon. The trip had not been without interest or excitement. We had stopped to see the spectacular rock formations of a mountain stream. We had waited before the Homer Tunnel for half an hour to receive a go-ahead signal, while the photographers among us fed and photographed a pair of keas (the New Zealand parrot) which had learned to beg at the roadside.

On this long drive, the one plant that I shall never forget was the tree fuchsia (*F. excorticata*), well-named because of its thin, pinkish-tan papery bark that peels off in thin strips. To find true fuchsia flowers—greenish-purple, becoming red with age—on a tree of this size was surprising the first time we saw it. On this day there were forests of *Fuchsia* up to 35 feet tall, with stout branches originating from near the base. Like many New Zealand endemics, this species is partly dioecious, producing both pistillate and perfect flowers on different plants. It is the only deciduous tree in New Zealand.

Miraculously the sun appeared for our two-hour trip down the magnificent Milford Sound, with its steep cliffs dripping with waterfalls. Even this far south the tree ferns persisted, lending a tropical appearance to the rainforest. We agreed that, despite the questionable weather, this was the ideal time to see the Sound, for later in the season the waterfalls, if they had persisted, might not have been so spectacular. Neither might the avalanches! With the warmth of the afternoon sun, the last pass that separates Milford Sound from the interior valleys was alive with snow falling in sheets from all sides, down sheer cliffs black with moisture.

***Fuchsia excorticata*, a tree fuchsia, the only deciduous tree in New Zealand, near Milford Sound. Photo: G. Pirzio-Biroli**

Satisified with our adventures of the day, we took time to look around us at Te Anau, and we found the usual mixture of garden plants. There was a white form of the large-flowered native legume, *Clianthus puniceus* (Kaka Beak). Behind our hotel grew a tall *Embothrium coccineum* in full flower. There were heathers. And there was a *pink* dwarf London pride (the *Saxifraga primuloides* that I have purchased so many times and been so disappointed in so many times?)

Invercargill

As we penetrated into the Southland toward Invercargill next day, the fertile landscape presented a typical New Zealand scene with typical variations. The tussock grasses, the sheep and the windbreaks of *Pinus radiata* were the constants. The farmhouses seemed to be larger

than on the North Island. In this area there was a lot of hawthorn, used for hedges and for growing alone. In the moist areas there were cabbage trees and New Zealand plants, both natives, growing with introduced willows, poplars and elderberries.

That afternoon at Invercargill (population 53,900) we visited Queen's Park, a multi-purpose park with extensive gardens intermingling with playgrounds and sporting facilities, including a large golf course. It is the pride of the southlanders, whose donations are a continuing source of support. Not the least of these gifts is a group of handsome bronze animal sculptures bequeathed to the children of Invercargill by the "soft-drink king", J.B. Thompson, in 1956. Like the Chinese camels at the Seattle Art Museum, these are kept polished by the numerous small bodies that have climbed and slid over and around them.

We were met by the Director, Mr. Metcalf, who said graciously that touring groups were a pleasure because they gave him an excuse to get out on the grounds. He told us that Invercargill is subject to sudden changes of weather, although rain (about 40 inches per year) is evenly distributed throughout the year. Winter temperatures can fall as low as 14 to 16° grass temperature (air temperatures are not so low). As with Wellington, wind is a critical factor in the establishment of a garden, for only Stewart Island stands between Invercargill and Antarctica. This problem has been met at Queen's Park with the establishment of windbreaks of *Pinus radiata* and *Cupressus macrocarpa* (the Monterey pine and cypress, respectively).

The gardens are magnificent! A massive group of 15-foot-high, 50-year-old rhododendrons ('Cynthia' perhaps?) was in full bloom down to the ground, with trunks forming a small forest much as the Loderi group do in our own Arboretum. We walked along Coronation Avenue between a double row of birches and beeches. An *Escallonia* hedge enclosed a garden of magnolias, rhododendrons and azaleas (mostly the Ilam strain). Again there were extensive plantings of native species mixed with garden plants from East Asia, Europe and America. Snowgrass, the tussock grass of the MacKenzie country, is grown here as an ornamental.

On our way out of Invercargill next morning, we stopped at Anderson Park, another of these handsome country homes given by family members for use by the public. The formal white mansion now houses the City Art Museum. The well-kept grounds, with large beds of pansies and herbaceous borders, are used for picnics, sports and public celebrations. Behind the house stands an umbrella-shaped elm with a 50-foot spread and huge pendent clusters of chartreuse samaras. We were told that it is a form of *Ulmus carpinifolia*. Old fashioned roses were trained on wire trellises.

Here the native bush has given way to sycamores, another of the introduced weeds of New Zealand. An effort is being made to replant with beeches (*Nothofagus* spp.), *Cordyline* and Rata (*Metrosideros*) species.

After lunch our bus detoured up a narrow road to a delightful small alpine nursery in Gore called Hokonui Alpines. The proprietress, Mrs. Louise Saumond, is a member of the American Rock Garden Society and was delighted to welcome us. Her well-tended rockery was planted with a colorful mixture of New Zealand alpines and such familiar treasures as *Lewisia cotyledon* from southern Oregon.

From Gore, we followed the eastern shore of

***Cordyline australis*, cabbage palm, in the Botanic Garden at Dunedin (page 26). Photo: J. Pirzio-Biroli**

the South Island northward to Dunedin, our last destination in New Zealand.

Dunedin

As is true of so many New Zealand cities, Dunedin (the "Edinburgh of the South") is built at the end of a long, sheltered harbor on a steeply sloping site surrounded by hills. Also, as with many New Zealand towns, there is an extensive Town Belt (an area preserved in native bush). This is administered by the Department of Parks and Recreation, which also runs the Botanic Garden.

On our last full day in New Zealand, we had a complete refresher course. We were met by three members of the Parks Department staff: Neville Struthers, Norman Richie and Alison Evans. The latter young woman was the Park Department's botanist. Among the three of them there was a great wealth of information about New Zealand's plants, Dunedin's gardens and Dunedin itself.

In a preliminary talk, they told us that Dunedin has an equable climate with 28 to 35 inches of rain per year. Their main problems are the wind, the bluestone (clay) upon which Dunedin is built, and the introduced exotics, of which sycamore was once more singled out as a villain. Dunedin has an extremely rapid plant growth rate—three times that of England and five times that of America, they said. When we saw the size of some of the rhododendrons in the Botanic Garden, we were inclined to believe them, although the gardens were founded in 1868.

One enters the Botanic Garden through a row of southern beech (*Nothofagus*) species, massive with age. New Zealand natives alternate with introduced, horticultural plants. A brilliant blue *Ceanothus* that we had noticed all over New Zealand was identified here as *C. papillosus var. roweanus*, although it strongly resembles our own *C. impressus* 'Puget Blue', which certainly is hardy enough to thrive anywhere in New Zealand. We walked through a valley where *Rhododendron* hybrids and species towered above our heads. There were *R. discolor* and *R. thomsonii* seedlings, examples of *R. fictolacteum* and *R. giganteum*, and a good pink *R.* 'Loderi Irene'. We were told that *Magnolia campbellii* grows rapidly here until it shatters in the wind.

After leaving the botanic gardens, we visited a section of the Town Belt where the bush is preserved. Here we descended into Ross Creek, a watershed which had formerly been closed for many years. Now it has been dedicated to educational and recreational purposes. Norman Richie, who grew up in the area, resents the invasion of outsiders; however, he was laughed down by his partners. There were again enormous tree fuchsias, podocarps and aristotelias. Our guides gave us another lesson in succession. In this area there can be two types of early succession. With clearcutting, the kinds of *Leptospermum* are pioneer species. With selective cutting, the seral species are *Aristotelia* and *Pittosporum*, with *Griselinia lucida*, which is able to stump-sprout. The wineberry (*Aristotelia*) is especially rapid-growing.

Regretfully we left our last botanic garden and our last piece of native bush, although the tour of Dunedin's beautiful harbor and the high tea at Lanarch Castle were a very pleasant end to our journey.

As I look back on what we saw and what we learned in those three weeks in New Zealand, I am frequently reminded that, although New Zealand was strange to us, there are parallels in our own country and in our own Arboretum that deserve mention. First, ours is also to a great extent a "man-made landscape". For example, the orchards and wheatfields of Eastern Washington were once desert until irrigation changed the appearace of that area. Similarly, we stress the importance of the unusual, introduced plants in this Arboretum that we are so proud of, but as one walks or drives through it we see that the basic structure is provided by our western red cedars, our Douglas firs and our hemlocks. Every rhododendron planting has its share of *Gaultheria shallon, Mahonia nervosa, Holodiscus discolor*—a small sample of the native plants that are growing in the Arboretum. Therefore, is it so strange to find *Nothofagus* or Rimu (*Dacrydium cupressinum*) forming the backbone of a New Zealand botanic garden? Is it so strange to find New Zealand species of *Hebe* hobnobbing with lewisias in an alpine nursery in Gore?

Plants are interesting whatever their origin. The true excitement of New Zealand lies in the variety of plants that grow there, the excellent growing conditions, and the enthusiasm of its population for plants and botanic gardens.

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Classes of Interest

University of Washington Arboretum— Urban Horticulture Courses

Pre-registration is required. Classes fill rapidly, so early registration is recommended. For more information, call 545-1373. To register, send check or money order with your name, address and daytime telephone number to: Arboretum Courses, Anderson Hall, AR-10, University of Washington, Seattle, WA 98195.

PRUNING ORAMENTALS. Learn basic pruning of ornamental trees and shrubs! This course, intended for novice gardeners, covers techniques of pruning and selection of proper equipment. There will be outdoor demonstrations at the Arboretum, so warm clothing and waterproof footgear are required. Instructor: Chico Navarro. November 14 and 21, 9:30—11:30 AM. Limited to 25; fee $20.

Pacific Science Center School for Science

To register, and for further information about these and other classes, call the Pacific Science Center at 382-4412 or 625-9333.

USING PLANTS TO YOUR ADVANTAGE. Learn how to place plants in the landscape to obtain design unity, privacy, climate and erosion control, low maintenance and year-round color. Instructor: Glen Hunt. Lecture November 5 from 7—9:30 PM; field sessions November 7 and 14 from 9:30 AM—noon. Ages: adult. Tuition is $27 (member) or $33 (non-member).

PLANNING FOR PEOPLE: SPACES, PLANTS AND PLACES. A series of lectures incorporating all factors and materials that influence landscape design, particularly on a residential scale. Participants will be encouraged to prepare conceptual plans for their own gardens with experienced students carrying their plans to basic solution. Instructor: Glen Hunt. Lectures November 10, 12, 17 and 19 from 7—9:30 PM. Ages: adult. Tuition is $35 (member) or $43 (non-member).

BIRDWATCHING: SEATTLE. Learn about the many varieties of birds in our locality; their behavior, habitats and migration patterns. Participants provide their own transportation to the field trip sites (Discovery and Lincoln Parks), bring binoculars, and wear warm clothing and footgear. Instructor: Scott Horton. Lecture November 11, 7—9 PM; field trips November 14 and 21, 9—11 AM. Ages: family. Tuition is $26 (member) or $33 (non-member).

STAIRCASE RAPIDS DISCOVERY HIKE. Spend a day on a leisurely 4.5 mile hike along the north fork of the Skokomish River, one of the most scenic places on the Olympic Penisula. Learn the history, vegetation and wildlife of the area. Walking shoes, raingear and warm clothing are a must. Transportation and a tasty lunch will be provided. Instructor: Brad Bradley. November 21, 8 AM—5 PM. Ages: adult. Tuition is $25 (member) or $32 (non-member).

HOW TO CHOOSE A TELESCOPE. If you are planning to purchase a telescope for yourself or as a holiday gift, include this course in your fall agenda. Learn all about the different types of telescopes. Instructor: Ken Miller. November 5 and 12, 7—9 PM. Ages: family. Tuition is $18 (member) or $23 (non-member).

BEASTS AND BRUSHES. Experiment with some simple techniques of illustration to explore the variety of shapes, colors and textures of the animal world. Instructor: Lisa Tranquada. November 4, 11,

and 18, 3:45—4:45 PM. Ages: 9—12. Tuition is $15 (member) or $19 (non-member).

GIRL SCOUTS' BADGE: FOLK ARTS. Use the resources of the Pacific Science Center to help you fulfill the requirements for the Folk Arts Badge. Learn traditional Northwest Coast Indian story-telling, puppetmaking, carving, and painting (with salmon egg and clay pigments). Instructor: Nan Munsell. October 29, November 5, 12, 19, December 3 and 10 from 4—5:30 PM. Ages: 9—12. Tuition is $31 (member) or $39 (non-member).

DINOSAURS. Come learn about the many different kinds of dinosaurs, what they looked like, what they ate and how they protected themselves. Instructor: Scott Horton. November 7, 14, and 21, 1:30—2:30 PM. Ages: 6—8. Tuition is $14 (member) or $18 (non-member).

IT'S A BLAST! What is a volcano? What makes it erupt, and how is it formed? Learn the answers to these questions as we uncover the mysteries of Mt. St. Helens and other volcanoes. Instructor: Jeanne Falkin. November 7 and 14, 10:30—noon. Ages: 6—8. Tuition is $14 (member) or $18 (non-member).

LOCKS AND LADDERS. Find out how the Ballard Locks work and how the fish ladder was built. Learn about the life cycle and migration of salmon. Watch baby salmon developing in their nests; Instructor: Donna Stieg. November 4 and 5, 4—6 PM. Ages: 6—8. Tuition is $15 (member) or $19 (non-member).

ANIMALS INSIDE AND OUT. Why are some animals smooth while others are furry? Explore the skins of different animals, and discover how the size, shape and covering of an animal are related to how it lives. Instructor: Science Center Education Staff. November 4, 11, and 18, 3:45—4:45 PM. Ages: 4—5. Tuition is $15 (member) or $18 (non-member).

Arboretum Notes and News

The long-awaited irrigation system replacement became operational this May and seems to be functioning well. Its real test came during the drought period in July and August when, despite a few problems normally occurring with a new system such as this, the irrigation of such critical locations as Azalea Way, Loderi Valley and Rhododendron Glen was done automatically during the evening hours. This not only freed us many staff hours once spent in watering these areas, but also avoided the nuisance to visitors of having to dodge sprinklers during daylight hours. There are still a few bugs in the system but it is hoped that these will be eliminated by next irrigation season.

The new planting of summer-flowering heathers in Rhododendron Glen was visited by its sponsor, the Pacific Northwest Heather Society this August. This group supplied the planting plan and some 1,100 heather plants. The site was planted last October and is now beginning to make a good show. A large label explaining the planting is to be added shortly.

J.A.W.

1982 Horticulture Show

It's time to start planning for the 1982 HORTICULTURE SHOW, to be held in Southcenter Mall on March 20 and 21. This show is the Unit Council's gift to the people of the Seattle area. The show will emphasize displays of plants for spring color, and several educational demonstrations such as pruning, bonsai growing, and propagation techniques. Anyone who has ideas for the show or who would like to be involved in some way is encouraged to call Suzanne Wilson, 823-4972.

A tree of white willow, *Salix alba,* near the Arboretum entrance. Photo: E.F. Marten

Historical Uses of the Willow Tree and Its Wonder Child, Aspirin

*GAIL GENSLER**

Editor's Note: This paper was written for a class in Biomedical History: Medicinal Botany, taught by Professor Paula Gottdenker, at the University of Washington.

Wonder Drug, Wonder Tree

Perhaps more wondrous than the uses of modern-day aspirin are the historical medicinal uses attributed to the willow tree. A list of these, compiled from the information of over 3,000 years, includes the following: an astringent; an anti-pyretic against agues, fluxes and other fevers; an agent against pain of many kinds including that of gout, rheumatic fever and other inflammations, eye and ear troubles, indigestion, childbirth contractions, and sciatica; a diuretic; a blood purifier and to prevent blood spitting; a means of birth conrol and in the treatment of prolapse of the uterus and ovarian congestion; an antiseptic; a vermifuge; a treatment for liver disease; a treatment for skin diseases such as corns, athlete's foot, acne, dandruff, and greasy skin; a sedative; a tonic; a treatment for epilepsy and for snakebite.

*Gail Gensler is a graduate student in Science Education at the University of Washington. She has worked as a naturalist for the National Park Service and has long had an interest in ethnobotany.

The generic name for willow is *Salix*. The naturally occurring, active "wonder ingredient" found in willow leaves and bark is the glucoside salicin. A chemical derivative of salicin is salicylic acid. A further synthetic derivative of salicylic acid is acetylsalicylic acid, commonly known as aspirin.

Aspirin is now the world's most widely used and most effective treatment for mild cases of pain, fever and inflammation. It is highly effective against pain of headaches, muscular aches, impacted teeth, arthritis and menstrual cramps. Aspirin brings down a fever without impairing the body's other natural disease-fighting mechanisms and it has relatively few side effects. Researchers are currently studying aspirin as a possible preventive treatment for heart attacks, and as a major ingredient in an oral contraceptive for men. Few drugs claim such wide application!

Not until the 1970's was the mechanism of operation of aspirin discovered. We now know that aspirin works by suppressing the natural production of prostaglandins in the body. These hormones function in control of pain, fever, and joint inflammation, and in the normal operation of the stomach, intestines, reproductive system, bloodstream, heart, nervous system, lungs, and kidneys. If aspirin can suppress production of prostaglandins, and prostaglandins are vital to the balance of so many major body systems, it is no wonder that aspirin and the willow derivatives hold such wide spectrum power.

Reconciling Folklore With Modern Medicine

Many of the reported folk uses of willow can be explained by our recent understanding of prostaglandins and their interaction with salicin products. The apparently unrelated items on the list of old cures can be placed into several groups. The first group treats pain and includes cures for gout, rheumatic fever, muscular aches, childbirth pain, menstrual cramps, stomach aches, eye and ear aches, and sciatica. The second group treats fever and includes cures for fluxes, agues, and "St. John's Fire". A third group treats inflammation and includes cures for muscular aches and rheumatic fever.

Prostaglandins apparently play a major role in production of blood platelets which in turn form blood clots. Salicin-induced suppression of prostaglandins may therefore explain a fourth group of old remedies, the blood conditioners, including blood purifiers, treatment of bloody wounds, and prevention of blood spitting. The blood-clotting function of prostaglandins explains why modern doctors advise hemophiliacs, whose blood-clotting mechanism is already weak, to avoid using aspirin. Women in their third trimester of pregnancy should also avoid using aspirin. The fear in this case is that the aspirin might increase bleeding time, which could complicate delivery. Blood clots figure significantly in the incidence of cardiovascular disease. The recent high interest in aspirin as a possible preventive medicine for cardiovascular disease is based on aspirin's ability to suppress production of prostaglandins and thereby reduce the likelihood of formation of life threatening embolisms caused by clots (Schindler, 1978).

An interesting fifth group of folk cures links salicin products with birth control. Dioscorides, in the first century, advised women to take willow leaves along with water to prevent conception (Gunther, 1934). Leyel (1952) cited Culpeper in the 1600's as advising boiling the leaves in wine and drinking them as an anaphrodisiac. Leyel also suggested that black willow (*Salix nigra*) was still being used as an anaphrodisiac in America. Finally, although aspirin itself perhaps is being used as a contraceptive for women, its mechanism of action is not entirely clear. Reduction of prostaglandin levels may also reduce male fertility.

History of the Medicinal Uses of Willow

One of the earliest recorded medicinal uses of willow is found in the Egyptian *Papyrus Ebers*, written circa 1500 BC. According to Aikman (1977), the papyrus lists a decoction made from willow mixed with beer, figs, frankincense and other ingredients which was taken for four days to "cause the stomach to receive bread," i.e., as a cure for indigestion. Aikman also notes that the cuneiform sign for willow appears often on the 4,000 year-old Sumerian tablet from Nippur.

The next report on willow medicine comes from Hippocrates in 400 BC, who advised pregnant women to chew the leaves to ease the pain of childbirth. Dioscorides, Pliny, and Celsus, all living in the fiist century AD, also listed uses for willow. According to the *Greek Herbal of Dioscorides*, "the iuce out of ye leaves and barck, being warmed with Rosaceum in a cup of

Malum punicum (the pomegranate), doth help ye griefs of the eares" (Gunther, 1934). Dioscorides also prescribed willow for eye troubles, gout, dandruff, stomach pain, and as an astringent. His, too, was the first recommendation of willow to prevent conception. Additionally he credited the willow relatives, *Populus alba*, white poplar, and *P. nigra*, black poplar, with similar cures, as well as cures for sciatica, epilepsy, and "dull eyes". Trees in the genus *Populus* also contain salicin. Dioscorides' last willow cure was that for corns. He advised burning willow bark to ash, steeping it in vinegar, and applying it locally (Gerarde, 1633). Celsus, too, recommended willow leaves boiled in vinegar to treat prolapse of the uterus, and Pliny recommended poplar leaves soaked in vinegar as a poultice for gout (Gross, 1948).

It is interesting that several of the early uses for willow involved steeping the plant parts in vinegar, instead of the more likely choice of water. Vinegar is acetic acid. Aspirin is *acetyl*-salicylic acid. The acetyl group in aspirin is what prevents the strong stomach burning otherwise resulting from taking salicin derivatives orally. It seems possible that the herbalists of the first century may have recommended taking willow with vinegar to avoid the burning response.

In the second century AD, Galen used willow leaves as a cleanser and in treating sight impairments, bloody wounds, fistulas, ulcers and erysipelas—"St. John's Fire" (Gerarde, 1633, Gross, 1948). The eleventh century writings of the school of Salerno suggest willow as a vermifuge (anti-worm agent) and for treating diseases of the liver and eyes (Gross, 1948). According to Leyel (1952), Culpeper, in the seventeenth century, prescribed a liquor decoction of willow leaves to "stay the lust in man or woman." Gerarde's *Herbal*, published in 1633, listed the willow as an astringent, and for use against spitting of blood and blood fluxes.

The *Herbal* also recommended setting green willow boughs in a fever patient's room to cool the air. This "anti-fever" mechanism is similar to an early 1700's Louisiana folk use of willow leaves (Aikman, 1977). Fever patients were urged to lie down on a heap of cool willow leaves so that the fever would transfer to the leaves instead! The *Royal Pharmacopoea Galenical and Chemical*, published in 1678, prescribed oil of poplar to reduce fever and pain in the head. The fever was supposed to transfer from the head to the wrists and feet (Charras, 1678).

In 1751, Boerhave suggested the use of salicylate as a diuretic (Gross, 1948). Twelve years later, in 1763, the Reverend Edmund Stone in England published the first official scientific paper linking a willow bark derivative, salicylate, to fever reduction. Mr. Stone made his discovery while searching for a substitute for the rare and more expensive Peruvian bark, *Cinchona* bark, the source of quinine. He reasoned according to the Doctrine of Signatures, that "as this tree delights in a moist or wet soil, where agues chiefly abound, the general maxim, that many natural maladies carry their cures along with them, or that their remedies lie not far from their causes, was so very apposite to this particular case, that I could not help applying it. . ." (Tainter, 1969). Stone's discovery led to the recommended use of willow bark as a substitute for Peruvian bark, and great interest in salicin derivatives ensued.

In the nineteenth century, research began in earnest on the chemical structure and properties of the active substance in willow bark. In 1826 salicin was discovered as the active ingredient in the bark. Salicylic acid was first manufactured in the laboratory in 1874. The laboratory synthesis of salicylic acid led to a surge of research on its uses and more reports confirming its use as a quinine substitute. The 1800's also saw T. MacLagan's "official discovery" of salicylic acid's use in treating inflammation and rheumatic fever. It is interesting to note, however, that MacLagan himself reported that the Hottentots in Africa supposedly had been using wililow bark to treat rheumatic diseases for many years before his discovery (Gross, 1948).

Although acetylsalicylic acid was first synthesized in 1853, it was not until 1899, less than 100 years ago, that Felix Hoffman, a chemist at the Bayer Company in Germany, discovered its value as a non-burning substitute for the popular salicylic acid his company produced and sold in great quantities for treatment of arthritis. That year, Bayer introduced acetylsalicylic acid under the trade name of Aspirin (Dixon, 1963). Today, aspirin is no longer a registered trademark, and refers to the many compounds sold that contain acetylsalicylic acid.

What Else is Willow Good For?

In addition to its numerous medicinal properties, willow has long played an integral role in the social and religious aspects of many cultures. Since Biblical times willow rods have been used in making baskets, tubs, bands, and caskets (Gerarde, 1633, Moldenke, 1952). The American naturalist Thomas Nuttall reported (1857) that willow wood was used in building fences and as fuel, that willow bark was used in the tanning process, the leaves yielded a yellow dye, and the down of the seeds provided an excellent cotton substitute. Michau (1857) reported the American use of European willow in making charcoal for gunpowder. Currently, salicylic acid is used as a preservative for milk and meats, and as a flavoring in candies and soft drinks. In the past salicylic acid has been used as a surgical antiseptic, and it is still used today in treating corns and other skin diseases, including athlete's foot and dandruff.

Willow references appear often in the Bible. The 137th Psalm recounts the tale of the exile of the Israelites from Zion: "By the waters of Babylon, there we sat down, and we wept when we remembered Zion. On the willows along the river we hung our harps." Legend holds that it was the weight of the harps that bent the willow branches, thus creating the species Linnaeus named "weeping willow" or *Salix babylonica*. However, it is now believed that this species is native to China and that trade with China did not occur until *after* the time of the Babylonian exile, circa 570 BC (Moldenke, 1952).[1]

Several Shakespearean plays make melancholy reference to the willow, such as in Othello: "I will play the swan, and die (singing) 'Willow, willow, willow.' " According to Leyel (1952) the black willow is ruled by Saturn and is related to mourning and loss. Skinner (1925) reports that the Chinese have associated willow with death and the uncanny for thousands of years. He states that the Chinese in the 1920's were planting willow in cemeteries and strewing willow sprigs on coffins, "for being of long life it is a reminder of immortality." Only time will tell to what uses the wonder plant and its wonder child, aspirin, will be put in the future.

[1]The willows of Babylon were *Populus euphratica*, (Bean, W.J. 1980. Trees and Shrubs Hardy in the British Isles, 8th edition, Vol. IV:261.)

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The rain set early in to-night,
  The sullen wind was soon awake,
It tore the elm-tops down for spite,
  And did its worst to vex the lake.

ROBERT BROWNING
from *Porphyria's Lover*

***Andromeda polifolia*, bog rosemary, and other members of the Ericaceae contain andromedotoxin (page 38).**
Photo: D. Normark

Plant Problems and Problem Plants

*MARJORIE I. CLAUSING**

Editor's note: This article helps to remove unwarranted fears about poisonous plants while explaining the actual dangers. The list of poisonous plants is not intended to be exhaustive, but merely to serve as an outline of common plants to be avoided. For more description of the plants treated herein, and for information regarding other poisonous plants, the reader should consult the list of references for this article.

To the gardener a plant problem may mean aphids on the roses, and a problem plant may mean the weed to be removed from the perennial border. To the parent whose child has eaten purple berries from an unidentified shrub in the neighbor's yard and for the information specialists answering the telephone at the Poison Control Center, both plant problems and problem plants mean plant poisonings and poisonous plants. What are some of these problems, and what are some of these plants?

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PLANT PROBLEMS

The Numbers Situation

It is true that the danger of plant poisoning is comparatively small; however, in 1980, 7,555 of the 48,450 calls answered at the Seattle Poison Center were related to plants. According to the National Clearinghouse for Poison Control Centers' statistics, in 1978, 14,349 of the 152,433 cases reported concerned plants. This puts plants at the top of the list of contaminant (poison) categories involved in Poison Control Center calls. The figures do not mean, of course, that that number of people died of poisoning or were sick or even received treatment. The figures do mean that many people did come in contact with a plant contaminant or possible contami-

nant and that many people had a problem—a problem worthy of a call to a Poison Center.

Awareness of plant poisonings has increased in recent years. The percentage of calls relating to plants (National Clearinghouse for Poison Control Centers) was 4.5% in 1972, 11.7% in 1978, and 15.5% in 1980. Why the increase? More house plants are being sold and grown, more backyard gardens are flowering all over the cities, more people are foraging in the wild for edibles, and there is a resurgence of interest in herbalism.

The Literature Problem

Some of the writings resulting from the increased interest in the plant kingdom may be considered part of the problem. Because more is unknown than known concerning the toxicity of plants, people tend to cling tenaciously to whatever information is available. Thus, plants often get bad reputations from a single incident which may have had nothing whatsoever to do with the plant itself. Apparent plant poisonings can be caused by chemical sprays or by some unrelated contaminant. One such case is that of the Christmas poinsettia. Long listed as deadly poisonous, it has now been eliminated from the systemic poisoning lists. Poinsettia does contain a milky substance which may irritate the skin.

Books concerning foraging for wild foods may provide the impetus for the inexperienced to eat a wild plant. This experimentation might in turn result in a frantic call to the Poison Center when a stomach ache ensues or when the forager questions the identification of an already eaten plant. Field guides and botany books which may be useful to a botanist for identification of plants may not be helpful to a novice. Identifying mushrooms from a book can be very dangerous business!

Perhaps because we generally think of plants as beneficial, when someone is poisoned from eating a plant, it seems much worse somehow. We accept dangerous drugs for just that, but our pretty plants? Never. Articles and pamphlets with such titles as "Poison in Your Backyard", "The Sinister Garden", and "Are You Growing Poison?" are essentially lists of poisonous plants which enumerate all the unpleasant effects of eating or touching plants. Such articles frighten some readers. Some people have suggested that all poisonous plants sold in the nurseries must be labeled as such, while other people have written articles contradicting much of the information on plant toxicity. "Poisonous Plants—the Case of the Guilty Garden" by Robert Lederer of the American Association of Nurserymen refutes much of the writing about poisonous plants, while other articles attack the statistics on plant poisoning and claim that poisonous plants are overemphasized. What to believe?

Usually, plant literature is aimed at the adult reader and does not reach the child who is the one most often involved in plant ingestion incidents. However, recently, a small booklet entitled *Mud Pies and Other Recipes* was brought to our attention. It contained such recipes as "Left-Handed Mudloaf" which says, "Sit on the ground with a bowl in front of you full of thick mud. With your left hand, reach out and add a fistful of whatever you find there. Stir and pack into a loaf pan . . ." or ". . . Gather enough green leaves to fill a big bowl . . . when seasonings and leaves are well blended, the salad is ready to eat." While these recipes may have been written in all innocence for a little "homesy" fun, they present a philosophy which is in complete disagreement with the Poison Control Center's suggestion: "Teach your child not to put anything in the mouth unless it is food, or offered by a parent or responsible adult." (There are good books for children about poisonous plants, such as *Poisonous Plants* by Peter Limburg.)

The Identification Problem

The problem of identification of plants may be either qualitative or quantitative. Of 14,349 reported plant-related calls, 11,010 involved children under five years of age. People under five often do not make reliable witnesses concerning what or how much of any given plant or berry was eaten. One of the most frequent calls our Poison Center receives is reported as "unknown berry—ingested in unknown amount." Treatment in this case is often the administering of syrup of ipecac, an emetic which is now the most favored method of emptying the stomach when something has been eaten that should not have been. One can not wait for symptoms to see if a child has actually eaten something harmful, for it may then be too late for effective treatment.

The problem of identification is compounded by the fact that many adults are not interested in

plants and do not know the names of the shrubs and trees growing in the places where children play.

The Poison Center is well equipped with readily retrievable resource material concerning plants, but the plants must be properly identified before the center can find this information and pass it on to the caller. The use of common names instead of botanical names further compounds the problem. The common name used for a plant in one area may denote an entirely different plant in another area. Think how many different plants are called "buttercups". It is also impossible for the information specialist at the Poison Center to make an identification over the telephone. Thus the responsibility for identification must lie with the caller. The Seattle Poison Center suggests that a caller take a large sample of the material in question including a branch with leaves, stems, berries and flowers to a nearby nursery or to a reliable "plant person". It may be important to ask for the manager or master gardener of the plant department, and to take the sample to a reputable and knowledgeable source.

The Problem of Toxicity

What of the available information regarding the type and amount of toxin in any given plant, or the amount of a plant or berry that might cause a problem if ingested? This is information far from complete at best. In addition, reactions of people to plants and plant parts differ as much as their reactions to various drugs, so that what is not a problem for one person, may be for another. This may account for the fact that many lists of toxic plants do not agree; plants can be found listed in one place as poisonous and listed in another as food for foraging or as a home remedy for a common malady.

Testing techniques for "how much" are most difficult—after all, who wants to volunteer to eat holly berries, long acclaimed "poisonous", to see how many can be eaten before one becomes sick? Many plants have not as yet been studied from a toxicologic standpoint and in some others, it has been impossible to separate out the toxin. In the past much of the testing for poison in plants has been done on animals. But when one is concerned about one's child who ate the *Daphne* berries, how many it took to kill a rat may seem of little consequence. Much of the information on how much of a plant will cause a problem is gleaned from past reported cases, not always a very accurate way to compile data. Since not all cases are reported, the quantity and even quality of the data are often mere conjecture.

***Kalmia latifolia*, a highly prized ornamental (page 38).**
Photo: D. Normark

The Problem of Ingestion Only

This problem has no relationship to the identity of a plant or to the amount ingested. Any plant or any part of a plant ingested by a small child can be a problem simply because it is a foreign body. A tiny child may suffocate on a leaf or berry because the child is unable to or does not chew it up and it blocks the airway. Therefore the problem of ingestion cannot be dismissed simply because the plant in question is not considered toxic. All bulbs, tubers and seeds should be stored in safe places, all house plants should be kept out of the reach of young children.

Solutions?

And what are some of the solutions to these problems? My suggestions are as follows:

Do not insist upon nor rely upon exact numbers concerning plant ingestions. We are questioned constantly for statistics concerning exactly how many people died from eating exactly how much of exactly what! Statistics from the National Clearinghouse of Poison Control Centers and the National Poison Center Network both reflect only statistics voluntarily turned in by the 800 poison centers around the United States. Compilation can be difficult. Statistics can, of course, indicate trends, or compare

totals of a specific type of ingestion, or compare one year to another. There is no statistical way to differentiate the degree of illness among reported plant ingestions. Just be cautious when quoting statistics concerning plant ingestions.

Take a common sense approach to the problem of plant poisoning. Every now and then someone suggests that people should dig out or cut off all plants in their yards considered poisonous. This seems a little ridiculous. Instead:

1. Keep houseplants, bulbs and seeds out of the reach of children.

2. Know the botanical names at least of the plants that your young children or their friends have access to. This is where many amateur and professional botanists shine—you who are already involved in helping people learn about plants.

3. Teach children not to put anything in their mouths that is not food or has not been given to them by a responsible adult.

4. Do not rely on the birds and other animals as indicators that berries or plant parts are edible.

5. Do not eat wild plants or brew teas from them unless you are absolutely sure of their identity. (I'm sure some poisoned people thought they knew!)

6. Do keep syrup of ipecac on hand—just in case. It might save a great deal of precious time, if you should happen to need it.

7. Keep the Poison Center's number handy. It is **634-5252**. The specialists there will be glad to give you information on the toxicity of specific plants. Remember that actual ingestions and other emergencies take precedence, so you may have to wait.

8. AND do not be afraid. Enjoy your plants, but learn them; use caution, concern, and common sense.

PROBLEM PLANTS

Picking out the "poisonous plants" is not easy. Many plants can cause illness when consumed in sufficient quantity, but not all are "poisonous". Poisonous species contain one or several specific substances termed "toxic principles" that produce symptoms when small amounts are ingested. This definition however, refers only to systemic poisoning.

The National Poison Center Network Bulletin on poisonous plants states: "Toxins found in plants can include alkaloids, glycosides, oxalates, resins, and phytotoxins. These may be distributed evenly throughout a plant or concentrated in the root, stem, leaf, or fruit. The season, habitat, weather conditions and soil type can cause the amount of a given toxin to vary within plants of the same species."

Most experimentation has been carried out on animals (for obvious reasons) and it is not always clear whether a plant that is toxic to an animal will have the same degree of toxicity to humans. Just because birds and other animals eat certain plant parts with no problem does not mean that they are safe for human consumption. Not all plants have been studied from a toxicologic standpoint. Plants are chemically quite complex and much research is required to separate and identify the toxins that any given plant may contain.

Fortunately, most plants are harmless and a few species account for the majority of poisoning incidents. Toxicologists Ellis, Robertson and Rumack, (*Patient Care*, Jurie 1979, p.86) explain that "in 1976, 12 species were involved in more than one-third of the reported ingestions of plants, and fewer than 50 are thought to be responsible for 95% of all poisonings."

Many lists of poisonous plants are available. These lists can be useful as indicators but should not be considered definitive. Lists of poisonous plants vary a great deal in content, and it should be remembered that because a plant is not on a list does not mean that it is *not* poisonous. Some lists contain names of plants without making any distinction between systemic and skin-related poisonings.

Here are listed some problem plants, grouped according to their chemical content, or their similar characteristics. I have also included some of the symptoms resulting from consumption of a plant, and examples of common plants that belong to each group.

Plants Containing Oxalates

One group of plants about which many calls come to the Poison Center is the Arum family. Some of these contain insoluble calcium oxalate crystals, which under the microscope appear as tiny sharp needles. Many plants in this group are common houseplants, including *Dieffen-*

***Colchicum,* 'The Giant', a bulb which contains colchicine. This autumn crocus blooms resplendent near the Arboretum office.** **Photo: D. Normark**

bachia, *Caladium*, *Philodendron*, *Colocasia* and *Monstera*. These cause irritation in the mouth and swelling of the tongue and/or lips. In very severe cases, the swelling may make breathing and swallowing difficult. The symptoms are usually those of mechanical irritation, and the crystals pass undissolved through the digestive tract so that no systemic poisoning occurs. Some of the plants, however, are thought also to contain some toxic resinoids which may compound the problem. Some plants or plant parts contain oxalates in a soluble form which produces oxalic acid. This acid is harmful to the digestive and renal (kidney) systems, and removes calcium from the human system. The leaves of *Rheum raponticum*, garden rhubarb, are toxic. Wild *Arisaema triphyllum*, Jack-in-the-pulpit, and *Lysichitum americanum*, skunk cabbage, are sometimes dried and used in cooking, and can cause a problem as the oxalates are not destroyed either by drying or by cooking.

Plants Containing Glycosides (digitalis, digoxin)

Foxglove (*Digitalis purpurea*) and lily-of-the-valley (*Convallaria majalis*) contain glycosides which have the ability to produce cardiac (heart) changes. These plants may also contain mouth and throat irritants. All parts are toxic. While many people would have no difficulty identifying one of these plants when in flower (the spikes of *Digitalis* blossoms are easily recognized) try identifying the plant from only the new soft fuzzy green leaves! Small wonder that *Digitalis* has been confused with comfrey leaves and used to brew a fatal tea.

Nerium oleander, oleander, and *Ornithogalum umbellatum*, star of Bethlehem, also belong in this group. Oleander is not grown outdoors in the Pacific Northwest, but is sometimes used as a house or tub plant. *Ornithogalum* is a common garden ornamental.

Plants Containing Solanine

Solanine produces irritation and injury to the digestive tract followed by central nervous system symptoms. Many edible plants such as tomato and potato are solanums and contain solanine. Avoid all but the fruit of the tomato and the white tuber of the potato. The tomato plant is toxic, as are the sprouts and green discoloration of potatoes.

Solanum pseudocapsicum, Jerusalem cherry, is usually grown as a potted ornamental for its red berries. *Solanum dulcamara*, European bittersweet or climbing nightshade, is not a native here but has escaped and become a common weed twisting and vining in neglected areas. It is toxic when eaten in quantity. However, it is often confused with deadly nightshade (*Atropa* belladonna). *Solanum nigrum*, black nightshade, has white flowers rather than the purple and yellow of *S. dulcamara*.

Plants Containing Tropane-type Alkaloids (atropine and scopolamine)

Atropa belladonna, deadly nightshade, and *Datura stramonium*, Jimson weed, do not generally occur wild in the Pacific Northwest. Both of these deadly solanaceous plants produce symptoms of atropine poisoning: dryness of mouth, thirst, burning pain in the throat, dry, hot, flushed skin, abnormally high fever, palpitations, restlessness, excitement and delirium.

Lantana camara, lantana, which also grows wild in warmer climates, is sometimes cultivated here as an ornamental or used as a house plant. It contains the alkaloid lantadene A, which when ingested also produces the symptoms of atropine poisoning.

Plants Containing Phytotoxins

Phytotoxins are similar to bacterial toxins and venoms, but are absorbed from the gastrointestinal tract. The handsome seeds of *Abrus precatorius*, rosary pea, precatory bean or jequirity bean, are often used in jewelry making, or may be imported as part of a decoration. The seeds may be painted and thus not always easily recognized. The seeds can pass through the digestive system without causing harm, but if

chewed are quite toxic. *Ricinus communis*, castor bean, is cultivated as a showy ornamental indoors here, and outdoors in warmer climates; seeds are sold and thus are available in many places. The chewing of the seeds of either of these plants may cause burning of the mouth and throat, but symptoms frequently are delayed and appear as stomach pain, bloody vomiting and diarrhea, and may even lead to fatal kidney malfunction.

Plants of the Parsley Family (Umbelliferae)

In this family are two violently poisonous plants that belong to different genera and contain two different toxins: *Conium maculatum*, poison hemlock, grows here as a weed in vacant lots and near little-traveled sidewalks. It resembles Queen Anne's lace in flower, which has hairy stems and leaves while the poison hemlock has smooth, hollow stems splotched with purple. Queen Anne's lace (*Daucus carota*), sometimes called wild carrot, although generally non-toxic may occasionally cause skin irritation. *Cicuta douglasii*, water hemlock, is found in wet and swampy places. It is sometimes mistaken for cow parsnip and the root is then eaten. Cow parsnip has one long taproot while water hemlock has a bundle of fleshy roots, not unlike dahlia tubers in growth pattern.

Heracleum lanatum, cow parsnip, should be considered an allergen, and contact with it should be avoided because of the dermatitis that it can cause. However there are also reports of difficulties resulting from breathing the smoke of burning *Heracleum*.

Plants Containing Andromedotoxin

Many members of the Ericaceae, which comprise such a large part of our Pacific Northwestern gardens, contain andromedotoxin. Rhododendrons and azaleas and species of mountain laurel (*Kalmia*) and *Pieris*, contain andromedotoxin, which causes watering of the eyes and nose, slow pulse, vomiting, low blood pressure and paralysis. Luckily, these plants taste very bitter.

Plants Producing Bright Berries and Seed Pods

These plants are of special concern because of their enticement value. Here again, many seeds and berries will not release toxin unless they are chewed. It is fortunate that young children are often not very good chewers!

Ilex aquifolium, Christmas holly, has not yet had its toxic principle defined. The berries themselves act as an emetic and are vomited so it takes a good many berries to cause a problem. While the toxicity of other species of *Ilex* has not been determined, it is wise to avoid them.

The white berries of *Phoradendron flavescens*, mistletoe, contain toxic amines which may cause gastroenteritis and hypertension if enough are eaten.

Yew (*Taxus*) is a plant in which everything is toxic except the red fleshy part (aril) of the "berry". The poisonous parts contain the alkaloid taxine. The toxic seeds, encased in the red part of the berry, are difficult to avoid.

Although there is discussion about the toxicity of *Skimmia*, it is reported to cause cardiac or pulmonary arrest, and should be avoided. All parts of the plant are reportedly poisonous, but the red berries are particularly attractive.

Daphne mezereum is the species of *Daphne* most often found on lists of poisonous plants, but all daphnes contain the toxin daphnin. Perhaps because *D. mezereum* has such bright showy berries, it is the most frequently ingested.

Members of the Pea Family (Leguminosae)

These plants should be judged with caution even though our garden cultivars are both delicious and healthful. The seeds of *Laburnum*, golden chain tree, contain a poisonous substance called cytisine. Although books list all parts of the plant as containing this toxin, the seeds are the most often ingested. *Wisteria* beans, the most toxic part of the plant, contain resin and a glycoside, wisterian. Ingestion of the beans produces mild to severe gastrointestinal symptoms. *Lathyrus odoratus*, sweet pea, contains a toxic amine. Although a single ingestion or a few seeds eaten would pose no large problem, handful amounts might do so. *Cytisus scoparius*, broom, also produces toxic seeds which should be avoided.

Bulbs

Bulbs and some plants produced from bulbs should be viewed with skepticism. *Colchicum autumnale*, autumn crocus, produces the drug colchicine, used to alter chromosomes. All parts are said to be poisonous but especially the bulbs and seeds. Results of ingestion are burning pain in the mouth and kidney failure.

Narcissus, daffodil or jonquil, has been said to cause illness if eaten in quantity. Although the toxic principle has not been identified, the symptoms are nausea, vomiting and trembling.

Zygadenus, death camus, grows wild in Washington and all parts of the plant contain an alkaloid that causes bradycardia (slow heart beat) and lowers the blood pressure when taken in small amounts. When not in flower, this plant can easily be confused with the bulbs of *Camassia*, the edible quamash used by native Americans.

Dried Seeds and Nuts

Nutmeg (*Myristica fragrans*) and *Convolvulus* and *Ipomoea* species have seeds that are mildly hallucinogenic. These seeds also cause nausea, rapid heart beat, excessive thrist, delirium and stomach pain. The leaves, flowers and seeds are all toxic.

Oak (*Quercus*) and beech (*Fagus*) nuts have been guilty of poisoning livestock when excessive amounts of raw nuts and young leaves have been eaten. *Raw* nuts may also be dangerous for humans.

Plants Causing Problems Upon Contact

Some of the most infamous skin irritants include *Rhus diversiloba*, poison oak, and *Rhus radicans*, poison ivy. *Oplopanax horridum*, devil's club, has horrible thorns and is usually associated with injuries. *Urtica* species, nettles, cause a short-term itching and rash, although young nettles can be eaten when cooked!

Mushroom Poisoning

Mushroom poisoning is important to consider, particularly in our mushroom-prolific Pacific Northwest, and there are many misconceptions concerning the topic.

The only way to distingush between a poisonous and an edible mushroom is to be able to identify the mushroom to species and to then look up its edibility. Cooking usually does not destroy mushroom toxins, especially the deadlier sorts. Poisonous mushrooms do not turn a silver spoon black. Mushrooms are not safe just because the skin of the cap peels readily.

The toxins in mushrooms are as varied as the toxins in green plants, and no single treatment is adequate for all types of mushroom poisoning. In fact, the wrong treatment can aggravate a case of mushroom poisoning.

Mushrooms are difficult to identify without in-person training and a mushroom should never be consumed unless identified by a knowledgeable person. It is easy to make misidentifications when teaching oneself from a book. It is impossible to identify mushrooms over the telephone. Specimens to be identified should be wrapped in waxed paper (not plastic) and refrigerated (not frozen) until brought to a specialist.

In cases of suspected poisoning, especially for small children, standard procedure is to give the person ipecac. The mushroom can then be identified and additional measures taken if necessary.

The Puget Sound Mycological Society has a helpful publication entitled *Mushroom Poisoning in the Pacific Northwest*. Members of that organization have been most helpful to the Poison Control Center in the identification of mushrooms and in teaching identification to many persons to help alleviate the problem of mushroom poisoning.

Most Poison Centers have poison plant lists available. One entitled "50 Common Harmful Plants" is available form the National Poison Center Network, 123 De Soto St., Pittsburgh, PA., 15213. The Seattle Poison Center's list of "Plants that Poison" is available upon request. Call (206) 634-5252.

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New Members of the Arboretum Foundation

We are pleased to welcome the following new members (February 1, 1981 through May 31, 1981): *Family*—Mr. & Mrs. Charles Badley, Joan C. Bartmes, Dr. Richard Briggs, J.B. Fleury, Mrs. & Mrs. Eric Frankel, Dr. & Mrs. Matt Hanford, John E. Pilcher, Mrs. & Mrs. Loren Strawn, Mr. & Mrs. George Uchida. *Sustaining*—Mrs. M. Louise Kent, Mrs. Mary Lawson, Mrs. Fay Page. *Annual*—Mrs. Sonia Alexander, Joy Alford, Mrs. Dorys Alkire, Mary Anderson, Lauren Arent, Mrs. Jack Baird, Mrs. Hazel Baldwin, Filomeno Baptista, Mrs. Richard Barbrack, Louise Bates, Mrs. Marilyn Bender, Mrs. James Bishop, Mrs. Diana Blake, Blue Ridge Garden Club, Peter Brazitis, Marie Brown, Mrs. Carol Bryan, Mrs. Bruce Bryant, Phoebe Burns, Ellen Cameron, Adeline Campbell, Mrs. Marian Chadwick, Robert Chase, Deborah Cheadle, Mrs. Robert Cole, Mrs. Margaret Collins, Mrs. Paul Cope, Mrs. Patricia Curtis, Sheila Cutler, Darrel Davis, Mrs. Sandra Devine, JoAnn Dickey, Alana Dils, Mrs. Lucille Dougall, Louise Earl, Bonnie Edgar, Carolyn Engleskjen, Elizabeth Engle, Everett Community College, Mrs. Melissa Firuz, Mrs. John Fitzgerald, Mrs. Dennis Flynn, Joan Fulton, Faith Gaines, Mrs. Ben Gardner, Dawn Giberson, Cheryl Ginter, Edie Mae Goll, Karen Graves, Gordon Gray, Joanne Greeley, Mrs. Jackie Griffiths, Mrs. Daphne Guernsey, Mrs. Bruce Hanson, Mrs. Floria Hazen, Mrs. Charles Higgens, Mrs. Geraldine Hixson, Joanne Holbrook, Mrs. Katherine Holder, Lee Hurd, Mrs. Penny Igl, Valerie Igl, Mrs. Margaret Irwin, Mrs. Roy Jackson, Doris Jones, Grace Jones, Mrs. Betty Keeney, John Kennedy, Mrs. Roberta King, Dr. Emily Koeniger, Mrs. Robert Kucher, Mrs. Merrill Kuehn, Mrs. Helen Lahey, Jane Lasky, Caroll LaTurner, Janet Lawrence, Carol Liedke, Mrs. Shirley Lumry, Helen Macleod, Mrs. Robert Mahoney, Mrs. Shirleyann Marenkovich, Eleanor Matson, Mrs. R.B. Mattson, Susan Mehlman, Chris Miller, Tomio Moriguchi, Mrs. George Mullaney, Mrs. Michelle Nash, Mrs. Evelyn Nelson, Mrs. Harry Nilsen, Darlene Norden, Mrs. Eleanor O'Larey, Allen Orr, Mrs. James Peterson, Mrs. John Peterson, Willard Peterson, Richard Pitt, Mrs. Nadine Prince, Mrs. Anne Marie Puzzo, Lucille Ann Rall, Mrs. Robert Randall, Sally Richardson, Jacilyn Robey, Mary Alice Sanguinetti, Mrs. Donald Shay, Roger Shelton, Virginia Sherry, Francine Sholty, Don Shorno, Mrs. Patty Shultz, Mrs. Susan Simon, Dorothy Ann Smith, Mrs. Roy Strandberg, Meredith Stratton, Mrs. Archie Stuart, Mrs. Hal Thompson, Kathy Thornton, Mrs. Barbara Thorson, Grace Travis, Vivian Vasquez, Nicon Vickey, Mrs. Karl Voegtlin, Mrs. Phyllis Von Wolffersdorff, Corydon Wagner III, Emily Whiting, Mrs. Diana Wolman, Linda World.

Book Reviews

DOUGLAS OF THE FORESTS, by John Davies. University of Washington Press, Seattle, 1980. 188 pages, illustrations, maps. Price ca. $14.95.

At last the travel journals of David Douglas—of the fir!—are made available to us again. The John Davies selection gives the reader the very essence of Douglas, that remarkable 19th century collector and explorer of our rich Pacific Northwestern flora. Long before there was Portland, Seattle, and the urban clutter in between, this intrepid Scot visited our northwest wilderness to learn about and sample its botanical treasures. Since Douglas was commissioned by patrons of both botanical and horticultural interests, the harvest of his extended travels has rewarded both the herbarium botanist and the gardener. Some of our finest native plants made their way into British gardens via the discerning collecting efforts of David Douglas.

The journals cover the wanderings of Douglas, encompassing his two visits to the Columbia River country and its hinterland. The first visit is amply recorded in the journals: Douglas' impressions of the coastal country around Fort Vancouver, the upper reaches of the river and the long trek east to the Atlantic seaboard.

Douglas' first visit to the Northwest, from 1825 to 1827, gets a full, extended coverage in the book: the landscape of the northwest country, its great diversity of plant and animal life, and the daily lives of the Indians and early settlers. Douglas was a loner, usually travelling only with his beloved dog and an Indian guide; adversity beset him repeatedly—loss of collections and notes, acute suffering from miserable weather, and attendant bodily ills. Yet his harvest of plants was remarkable in both quantity and quality.

Douglas' second journey, from 1830 to 1833, ended in double tragedy: the loss of his journals of this second trip and then his tragic death in Hawaii. Yet Davies manages to piece these later years together, using the surviving letters that Douglas sent to his mentor back home, the celebrated botanist, William Hooker.

Besides giving us the essence of Douglas in his own words, author Davies fills out the Douglas story with a useful biographical sketch. Further, the book gives us lists of the plants and animals collected by Douglas, as well as other information on the life and times of the one man who made the greatest contribution to the knowledge of the plant life of our vast Pacific Northwest country.

It is tempting to tantalize the readers-to-be of this book with some quotes. Try these for the flavour of Douglas, the redoubtable explorer and Man of Grass:
p. 36. First impressions: "On stepping on the shore *Gaultheria shallon*, salal, was the first plant I took in my hands. So pleased was I that I could scarcely see anything but it. Mr. Menzies (of the Vancouver expedition) correctly observes that it grows under thick pine-forests in great luxuriance and would make a valuable addition to our gardens."
p. 102. Adversity and the weather: "Last night was one of the most dreadful I have ever witnessed. The rain, driven by the violence of the wind, rendered it impossible for me to keep any fire, and to add misery to my

affliction my tent was blown down at midnight. I lay among bracken rolled in my wet blanket and tent till morning."
p. 103. Finding the sugar pine (*Pinus lambertiana*): "At midday I reached my long-wished *Pinus* (called by the Umpqua tribe *Natele*), and lost no time in examining and endeavouring to collect specimens and seeds . . . The putting myself in possession of three cones nearly brought my life to an end. Being unable to climb or hew down any, I took my gun and was busy clipping them from the branches with ball when eight Indians came at the report of my gun . . ."

All readers who delight in the natural wonders of the Northwest and who can empathize with the life of exploration will be amply rewarded by reliving vicariously the wonderment—and travail—experienced by David Douglas in the early 19th century. Highly recommended! *ARTHUR R. KRUCKEBERG*

ALPINES OF THE AMERICAS: THE REPORT OF THE FIRST INTERIM INTERNATIONAL ROCK GARDEN PLANT CONFERENCE, organized jointly by the American Rock Garden Society, Northwestern Chapter and the Alpine Garden Club of British Columbia in Seattle and Vancouver, July 18-25, 1976. Paper. Price $14.95. Available from the Northwest Unit, American Rock Garden Society.

The term "alpine plant" may sometimes be misleading. To the ecologist an alpine plant is one growing at high elevations, generally above tree line, often in a harsh, windswept environment. The rock gardener or horticulturist defines an alpine plant as a small plant desirable in a rock garden. As Albert DeMezey states, "It may be observed that about a third of the plant material generally found in rock gardens is not associated with rocks in nature nor with alpine elevations" (p. 73). *Alpines of the Americas* is a collection of forty-two papers presented at the First Interim International Rock Garden Plant Conference in 1976. These papers, about alpine plants in the horticultural sense, are interspersed with comments about the conference itself (held in the Pacific Northwest during the summer of 1976) and with descriptions of gardens visited and conference displays. Sixteen of the papers are about particular plant taxa: penstemons, irises, lilies, ericads, dwarf conifers and dwarf willows. Other papers are about alpine plants from different geographical areas such as the Andes, the pine barrens of New Jersey, the midwestern prairies and the Alaskan tundra. Papers by rock gardeners describe American alpines growing in England, Scotland, Austria and New Zealand (where there are open fields with rows of lewisias). Horticultural suggestions for successfully growing and propagating many of the plants are included, as well as information about which are easy and which are difficult.

Sallie D. Allen has contributed an interesting paper about some members of the Ericaceae which are not commonly cultivated. Her garden includes *Loiseleuria procumbens* from several different areas as well as the dwarf *Rhododendron camtschaticum*. The descriptions in "Collectors' Ericaceae" should entice other rock gardeners to try some of these plants.

Dr. Kruckeberg explains various meanings of the word hybrid, and Lee M. Raden and Albert DeMezey describe some desirable rock garden hybrids such as *Phyllodoce* x *intermedia*.

Ola Edwards provides an historical view of rock gardening by presenting some of Reginald Farrer's comments and rock gardening philosophy. Ann Zwinger, co-author of *Land Above the Trees*, eloquently discusses "Alpine Plant Communities of the Southern Rocky Mountains." Orchid culture is presented by Frederick W. Case, Jr., and H. Lincoln Foster lists some desirable plants for woodland gardens from eastern North America.

From this book the reader acquires an appreciation of a large variety of native plants from *Trillium flexipes* which, because "the flower is curved below the leaves and faces directly downward. . ." can be "best appreciated by very small persons." (p. 160) to polsters and ferns. Because so many plants are discussed there is sometimes a frustrating but inevitable lack of depth. The reader may easily be left wanting to know much more.

Alpines of the Americas contains four eight-page sections of color plates as well as occasional black-and-white photos and drawings. The drawings are useful but the black-and-white photographs tend to be dark. One wishes *Rhododendron camtschaticum* could have been in color. Most of the color photos are good; a few such as those of *Spraguea umbrellata* and *Opuntia polycantha* might have been more clearly reproduced. There are a few typographical errors such as "first" for "fist" on page 40 and "Eduador" for "Ecuador" on page 87. An index in the back lists all genera and species. There is no bibliography, and references are not listed for any of the papers.

This book will be useful to those who attended the conference as well as to any serious gardener or horticulturist interested in native alpine plants. It should be included in both university and public library collections. *MARY ALICE SANGUINETTI*

FLOWERING SHRUBS, edited by Pamela Harper. Brooklyn Botanic Garden Record: Plants and Gardens, Volume 37, No. 1, Spring 1981. (Number 94 of the Brooklyn Botanic Garden Handbooks.) Price $2.25 plus postage. (See also below).

In these days of spiraling prices in the bookstall as well as at the grocery, one of the better bargains for the run-of-the-mill gardener is the quarterly record from the Brooklyn Botanic Garden: *Plants and Gardens*. The most recent issue is *Flowering Shrubs*, a collection of articles by outstanding horticulturists and garden writers with Pamela Harper as guest editor. It includes a wealth of information garnered from experienced gardeners and well-known professional botanists in their chosen areas of interest.

In "Shrubs for Everyone", Mrs. Harper writes that nostalgic gardeners may want to grow what grandmother grew, but "if grandmother lived in New England and you have retired to Florida, you'll have to reassess the situation." She also describes the frustrated gardener and the impatient gardener as all-too-common phenomena to whom "the perfect shrub would be one which grew a foot a day until the desired height was reached, then stopped." In "What is a Shrub?", she reminds us that "There is only one good reason for growing any ornamental plant—that it gives you

pleasure. If it doesn't, chuck it out, though it has every other good quality".

James E. Cross, in "Flowering Shrubs for Limited Spaces", recommends care in choosing plants tailored for the garden and suggests diminutives of old standbys as well as naturally dwarf or slow-growing shrubs. He describes plants such as *Spiraea japonica* 'Alpina', *Syringa meyeri* 'Palibin', *Forsythia viridissima* 'Bronxensis', the familiar *Vaccinium vitis-idaea minus*, *Stephandra incisa* 'Crispa', and many others.

George Waters, talented editor of *Pacific Horticulture*, writes, "Wisdom gained in the garden makes the gardener, but reading provokes further observation. I hope to raise questions, the answers to which can be found among the plants in your garden." In "Planting and Pruning", he does that and more. He reminds us also of the use and misuse of our pruners and spades. Extracts from the works of Elizabeth Lawrence, who wrote the books *Gardens in Winter* and *A Southern Garden*, delightfully describe some "Winter Flowering Shrubs."

Camellias, hydrangeas, and rhododendrons are portrayed with enthusiasm and imagination by devotees of these genera. I was particularly intrigued by Polly Hill's "promising and novel alternative" of "Ground Cover Azaleas": a few lines describing the North Tisbury hybrids, the results of collaboration between the author and the prestigious Japanese plant breeder, Dr. Tsuneshige Rokujo. These cultivars are described as hardy, evergreen, late-blooming, low-growing, and excellent for small gardens, troughs and rock gardens.

In "Roses as Flowering Shrubs", Beverly R. Dobson promises pleasure in bloom, in fine foliage, and in shining hips, from a number of shrubby roses. She emphasizes the importance of choosing "shrub roses hardy in your climate, truly disease-resistant, and with flowers that shatter cleanly." Of special interest to rose growers would be the brief bibliography and the information about her annual source guide of hard-to-find roses.

Michael A. Durr, "Viburnums Old and New", says, "Anything I offer concerning viburnums should be considered slightly biased, for I have had a long-standing love affair with this most versatile and aesthetic group of flowering shrubs." Indeed, his enthusiasm must be shared by lots of northwesterners since so many of the plants he describes, with their lovely fruits and bright fall foliage, are found abundantly in Seattle area gardens.

Each part of the country is represented by descriptions of its most congenial specimens of flowering shrubs. Of special interest to many of us is "Flowering Shrubs for Coastal British Columbia, Washington, and Oregon", by J. A. Witt, Curator of Plant Collections at our own Arboretum and frequent contributor to these pages. Reading the names of plants he presents is like greeting old friends as you walk through your garden or through the Arboretum. He describes the winter-blooming plants which are especially welcome on our darker, cloudy days, plants such as *Garrya elliptica* (and the selected male form 'James Roof') whose long catkins often expand in late December and may last until the end of February, and whose dark green, crinkle-edged leaves persist throughout the year.

"Ironclad Shrubs for Urban Landscapes", by Gary L. Koller, contains a concise and explicit chart of some fifty shrubs, their botanical and common names, size, use, tolerance, attributes and pruning suggestions. The first criterion was to satisfy the need within the city for plants which would be undemanding as to type or quality of soil, tolerant of sun or shade, and able to withstand atmospheric pollutants.

Many illustrations dot the publication, with a centerfold of 14 excellently reproduced in color. This fine publication (No. 94) is included with Brooklyn Botanic Garden membership or is available by annual subscription of $5.00 per year ($8.50 for two years). Purchased individually this costs $2.25 plus postage. No matter how overcrowded the bookshelves become, I always can find a place to store one more of these handbooks for future and pleasurable reference.

NAN BALLARD

TO AUTUMN

Season of mists and mellow fruitfulness,
  Close bosom-friend of the maturing sun:
Conspiring with him how to load and bless
  With fruit the vines that round the thatch-eves run;
To bend with apples the mossed cottage-trees,
  And fill all fruit with ripeness to the core;
    To swell the gourd, and plump the hazel shells
With a sweet kernel; to set budding more,
  And still more, later flowers for the bees,
  Until they think warm days will never cease,
    For Summer has o'er-brimmed their clammy cells . . .

JOHN KEATS

CALENDAR OF EVENTS

Arboretum Foundation:		Regularly Scheduled:	
Executive Committee	November 12	Greenhouse Day	Every Tuesday
Board of Directors	December 3	The Mae Granston Rhododendron Study Group	1st Monday
Unit Council:		Northwest Natives Study Group	3rd Monday
Governing Board	November 5 January 7	Rock Garden Study Group	3rd Wednesday
Quarterly Meeting	September 18		

EXPLORERS' WALKS are scheduled for November 10 and 25, and January 27.

VOLUNTEER PARK CONSERVATORY SECOND SUNDAYS PROGRAM:
November 8, Bromeliads; December 13, Orchids (see page 8)

FREE PUBLIC LECTURE: THE HOLLY COLLECTION IN THE ARBORETUM
November 18 (see page 8)

NATIVE PLANT GUIDES LECTURE: December 8 (see page 8)
Montlake Community Center

NORTHWEST COAST GRAPHICS: through autumn at the Burke Museum (see page 8)

TIBETAN RUGS: through November 21 at the Burke Museum Boiserie (see page 8)

NOHS LECTURE: Soils Be It: The Root of Everything
January 19, 1982 (see page 8)

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Time Value Mail—Please Expedite

The brilliant abundance of autumn in the saffron fruit of the crabapple *Malus* 'Buttercup'. **Photo: D. Normark**

VISIT YOUR ARBORETUM IN AUTUMN

Fall color is a late arrival this year,
so seek out the oaks in November.

Autumn is the best season
for mushrooms erupting from earth.
Search in the Arboretum groves.

Join the Explorers' Walks, meeting at 10 AM, Tuesday, November 10 and Wednesday, November 25, in the Arboretum Administration Building Parking Lot. PLEASE WEAR BOOTS. The next walk will be the fourth Wednesday of January, 1982.